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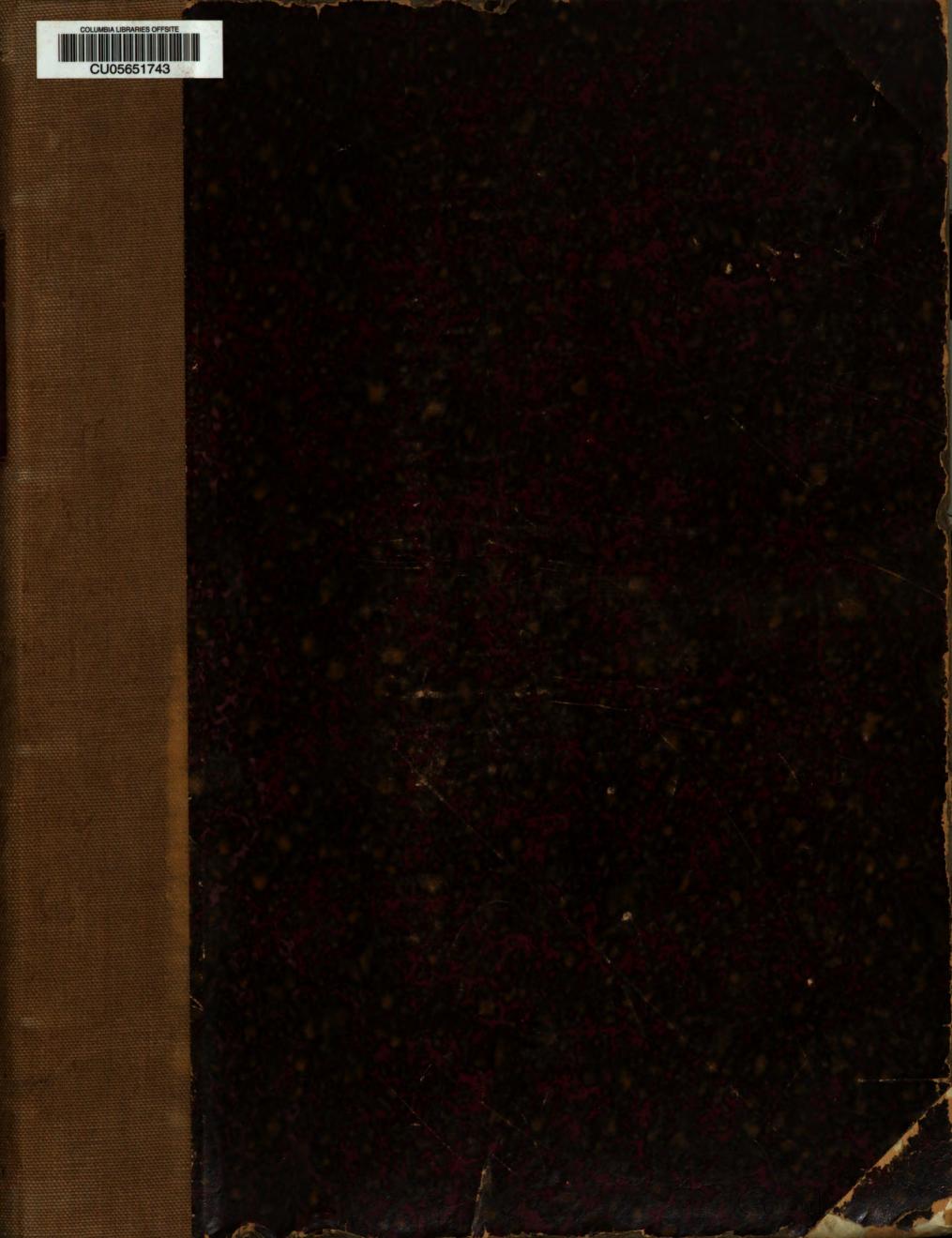
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# **FLECTRICITY**

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### EDITORIAL NOTES.

A Slight Concession on the Part of the New York Telephone Company. On January 1, the New York Telephone Company reduced its rates for service in this city on party lines. The

rates now in force range from \$60 a year for 600 local messages to \$135 a year for 1,800 messages. At first glance \$5 a month would appear extremely reasonable for telephone service but when it is recalled that this rate entitles the subscriber to but 600 calls a year, or less than two calls a day, to say nothing of the fact that another instrument is connected to the same wire and which may prevent the use of the telephone when most needed, the new minimum rate strikes one far from favorably.

Even with 1,800 messages for \$135 a subscriber would be paying over 7 cents a call for a decidedly limited and hampered service owing to the party line arrangement. Let the local lessee of the Bell monopoly reduce its rates to say 5 cents a call and do away with party lines, and although it might not be able to pay the munificent dividends in the future that it has in the past, the company would by no means go into the hands of a receiver and the public of New York City would be enjoying telephone service at somewhere near the same rates that are in force in other large communities.

\* \* \*

Steel-Framed Buildings and Electrolysis.

PAGE.

Is electrolysis endangering the foundations of steel and iron-framed buildings in Cleveland, Ohio? This is a ques-

tion that has been causing some discussion of late in that city.

About a year and a half ago this same question was brought up in relation to the high buildings in Chicago, resulting in an unofficial investigation being made. This examination is said to have shown that although stray electric currents were at work at the foundations of some of the structures, the rate at which electrolytic action was going on was so slow that no drastic measures were deemed necessary.

In the case of Cleveland, although this important question has been discussed theoretically by architects, engineers and electricians, no definite conclusion has been arrived at, owing, we presume, to no electrical survey having been made. One well known architect

discussing the matter recently is reported as saying :

"I have been unable to find in any buildings any effect from electrolysis. There are several things which would prevent this. The first is that in all of the large buildings the insurance Underwriters demand the most thorough kind of insulating on all electric wires, and a careful examination is made before they are covered. This prevents the electric currents from getting into the structural work.

"If in some way a wire should become bare and form a short circuit, the point of the wire at which it touched the beam would be so much smaller than the beam itself that there is good reason to believe that the wire would be consumed long before the beam or truss would be affected to any great extent. It might be possible, although I have never heard of a case, for the pipes in a building where there is a large amount of electricity, to be affected by electrolysis, but as far as I can learn there has been no effect discovered in the steel structural building.

"At one time, when the electric plants were first introduced into the boats of our navy, there was considerable talk that the steel hulls would be effected by electrolysis. Here there was no way for the current to pass out except through the hull. The Government appointed a commission to investigate this matter, and the investigation set the thing aside. If it does not affect the vessels it is hardly probable that its effects will be felt in the modern buildings.' That the hulls of steel vessels are not affected by electrolytic action in the same way that buried water pipes are is no sign that the foundations of steel buildings would not deteriorate through the action of stray currents, owing to the very different conditions existing. In the case of a vessel the area of contact between the hull and grounding medium or the salt water is so great as to cause practically no resistance to the passage of a current, whereas in high metal structures the grounding medium is cement, which, owing to the presence of unslaked lime, is neitl er a good conductor of an electric current or a perfect insulator.

In Chicago electrolytic action was attributed in part to stray trolley currents, which it was claimed passed from the clay soil to the steel beams or rails in the foundation piers, and thence to the supporting columns of the buildings. In cities such as Chicago and Cleveland, where the overhead trolley is extensively made

use of, stray currents might possibly affect the foundations of steel-framed buildings in the way mentioned, but in New York City little danger need be apprehended by property owners on this score, as the electrical surveys that have been made from time to time in the Borough of Manhattan have shown conclusively that there are but two or three spots on the whole of the Island where stray trolley currents exist.

In order, however, to settle once for all this much debated question, as to whether electrolytic action is affecting the supporting columns of high steel structures in the various cities, it might be well were a careful electrical survey made by some competent engineer, and we think the results obtained would warrant the trouble and expense.

\* \* \*

# Electricity vs. the Gasoline Motor for Automobiles

Several years ago when automobiles were a novelty a discussion arose as to what form of motive power was best adapted to the propul-

sion of this type of vehicle. The advocates of the mineral spirit motor claimed that it was much more reliable than any other form of power and pointed with pride to the many successful trials made with it in France, while the adherents of electricity defended the storage battery with equal tenacity.

This question, which has been discussed almost as much as the relative advantages of the direct and alternating current, was again brought up at a recent meeting of the Franklin Institute in Philadelphia. There were present several well-known experts who defended or pointed out the numerous advantages of the vehicle propelling power in which they were interested. One speaker prophesied that the future automobile would be a cheap and light electric vehicle. He admitted that the batteries were heavy and required strong construction in the carriage; also that the cost of pneumatic tires and their maintenance was a serious consideration, but he claimed that these difficulties were gradually being surmounted; that lighter batteries would make their appearance and that the tire question would be solved.

Another well-known inventor expressed the belief that the present experience in the practical use of automobiles had shown that the electrical vehicle had a limited field of usefulness. In his opinion the weight of the batteries could never be reduced to any great extent and still retain their efficiency. He predicted that within the next ten years gasoline motors would be used on heavy express and freight wagons and that 80 per cent. of all the self-propelled vehicles would be run by gasoline. During the discussion it was pointed out that electrical automobiles have been practically abandoned in France and that mineral spirit motor-driven carriages have become so popular that many are used by families for touring purposes and are enabled to travel at the rate of 100 miles a day. On the other hand, it was conceded that the great objection to gasoline motors is the offensive smell, which, as is well known, cannot be entirely gotten rid of even by employing a carburetor. It might also be added that another serious objection to this type of vehicle is the constant vibration which makes itself felt even when the carriage is at

Discussion on the relative advantages of electricity and gasoline as an automobile mo-

tive power will probably go on for years to come. That each type has its advantages and defects goes without saying, and the ultimate result of unlimited argument on the subject will, as in the case of the discussion on alternating versus direct current, simply go to show that each form of motive power has its own especial sphere of usefulness to which it is far better adapted than any other. Thus the future should see electrically operated automobiles plying in city streets, while mineral spirit motor carriages will undoubtedly be made use of principally by pleasure parties for long country runs.

\* \* \*

#### Heating and Cooking by Electricity.

Referring to the use of electricity in the household for cooking and heating purposes, we stated in these columns some time

ago that in New York City there was a slow, but constantly increasing demand for current for the purposes mentioned, in spite of the fact that its use entailed a greater expense than were gas employed.

In two recent issues of the London Electrical Review this question is quite thoroughly dealt with in a continued article entitled "The Position of the Electrical Heating Industry in this Country." Although conditions differ in Great Britain from those in this country, there is much in the article referred to that should be of interest to the electrical industry on this side of the Atlantic. In one of the opening paragraphs the writer says: "One reason for the slow introduction of this class of apparatus into everyday use has undoubtedly been the fact that, until comparatively recently, both the electrical supply authorities and the wiring contractors have not considered it desirable to push the matter. They have looked upon any kind of heating by electricity as expensive, and likely to bring them trouble. and without going much further into the matter, have condemned it as such."

As will readily be remarked this same hesitancy and lack of faith is what has, to a great extent, prevented a more extensive use of the electric current for heating and cooking in this country. As our contemporary aptly points out, however, in comparing electricity with gas or coal there are other points that should be taken into consideration besides the comparative cost of the fuels. Heating and cooking by electricity is far more cleanly than any other method, requires a minimum amount of attention, and last but not least, if the installation is properly designed the heat may be applied just where it is wanted and for the length of time desired. These advantages are certainly worth a monetary consideration, which should be taken into account when comparing the use of the electric current with other methods of heating.

That electricity should be more quickly adopted in England than in this country and especially in New York City for heating and cooking is indisputable, owing to the fact that current is usually supplied in Great Britain at a lower price per unit than here. For instance, the article says:

"With current available at 1d. or 1½d, per unit, the cost of heating one's house or cooking one's meals throughout will not be excessive, provided some other means is adopted for heating the large quantities of water usually required for domestic purposes, such as for washing up, supplying baths, etc., which cannot easily be dealt with electrically."

Now with gas at, say, 80 cents a thousand feet, electric current at 3 cents a kilowatt hour, would just about hold its own in the heating and cooking line, but, unfortunately, no such low rate exists for electric current in this city. The rates now in force are ten cents a kilowatt for the first three hours of daily use and five cents a kilowatt for all use in excess of that time, and it is these high rates that have, to a great extent, prevented the adoption of electricity for heating and cooking in New York.

Were the central station people so disposed they could undoubtedly do much toward encouraging the universal use of electrical heating and cooking by selling current for these purposes at a little more than the bare cost, but unfortunately they do not seem disposed so to do in spite of the fact that such a step should ultimately redound to their advantage, at least to a certain extent, by solving the troublesome problem of a day load.

#### UNDER THE SEARCHLIGHT.

#### Notes and Comments on Various Topics.

THE new incandescent electric lamp invented by Dr. Welsbach will, it is said, shortly be introduced into England.

WE are in receipt of the 21st annual number of *The Tradesmaa*. This issue is extremely voluminous, containing as it does some 235 pages of matter. Among other interesting and timely articles by authoritative writers is to be found one on the Electrical Development of the South, which embraces an account of the new sewerage system at New Orleans. This article, which is illustrated, contains much information of interest and is well worthy a careful perusal.

At the Eighth Annual Convention of the Northwestern Electrical Association, which will be held in Milwaukee, Wis., on January 17, the following papers will be read: "Modern Development in A. C. Series Arc Lamps," by R. Fleming, Lynn, Mass.; "Alternating Cu rent Phenomena," by Prof. Jackson, Wisconsin University; "Combination of Electric Lighting and Hot Water Heating Plants." by W. H. Schott, Chicago; "Central Station Economies," by H. W. Frund, Vincennes, Ind.: "Induction and Direct Current Motors," by Ralph D. Mershon, New York City; "Relative Desirability and Efficiency of Various Types of Engines on Central Station Loads," by Prof. Richter. Wisconsin University; "A Life Test of Incandescent Lamps," by Prof. Shepardson. Minnesota University; "A Canadian Plant," by L. G. Van Ness, Quebec. Canada.

A system of night signaling by means of flags held aloft by kites and illuminated by a suspended searchlight, on which Mr. William A. Eddy has been experimenting for some time, was given a practical trial last Saturday night at Bayonne, N. J. The searchlight was of about one hundred candle power and was suspended within a few feet of the flags. The light, which weighed three pounds when loaded with carbide and water, was sent up at a quarter to seven o'clock, suspended two feet below the flags, each of which was two feet square. Both light and flags were supported by one nine-foot and two seven-foot kites. The flags were fastened to the kite cable by perpendicular staffs. To brightly light the flags the searchlight was rigidly braced on the kite

cable in such a position that it pointed straight skyward. As the kites carried the cable upward the glare of the fiery pencil passed beneath the flying kites and upward into space. The rapid fluttering of the flags caused the effect of a stream of blue, white and red fire extending ten or twelve feet beyond the searchlight reflector. It was a prismatic effect, with the red bar of the spectrum furthest away. As a means of war signaling at night the experiment shows that a great variety of color and light effects can be produced and seen from a great distance. The spectacular effect was impressive, and Mr. Eddy believes that, aside from war signaling, this singular and new night aerial effect would excite wonder at the Paris Exposition and at night carnivals.

A CABLE dispatch to the N. Y. Herald states that the South Eastern Railway Company of England has made arrangements with the Wireless Telegraph Company for the Marconi system, to be used in the course of a few weeks on the company's royal mail steamers between Dover and Calais, and also on the mail steamers between Folkestone and Boulogne. This innovation is of great importance to the safety of the public traveling by the short sea routes, as when in mid-channel—say, half an hour from either the French or English shore—the ships will have telegraphic communication with either shore.

In discussing the question of submarine boat construction in its present aspects, a writer in the Marine Review remarks that, notwithstanding the indifference so generally manifested in England regarding such craft of every description, France has been the one European nation that has steadily endeavored to realize its development to the most perfect degree, despite the numerous failures which have taken place. These failures have, of course, produced much discouragement. It was not so very long ago that public gratification was at a high pitch over the Gustave Zédé, but it appeared later that the range of action of the vessel was limited in the extreme: the French authorities derived no little satisfaction, however, out of the fact that the Zédé had at least demonstrated the practicability of the submarine boat. Attention was next turned to the Goubet boat. and, after it had proved thoroughly impracticable, interest centered as generally in the Morse, but, as it is well known, with similar disappointing results.

The Speaker of the New York Assembly has selected Mr. Witter, of Tioga, as chairman of the Electricity Committee.

THE Third Avenue Railroad of New York has some of its cars equipped with a new life-saving fender. It is arranged to fold up compactly when not in use, and is fitted with a bracket on each side, which prevents objects caught in it from falling out. On a level road it does not run more than an inch above the track.

The automobile stage made its first appearance on Fifth Avenue of this city on January 2. It was a private trip of the officials of the Stage company and their guests, but so eager was the public to welcome the new vehicle that the driver was hailed in vain at street corners by many persons who wanted to ride. The vehicle accommodates eight persons comfortably inside, and has seats outside for four others and the driver. It is upholstered in brown

leather and is much more comfortable than the old stages. It has wooden wheels, with three-inch solid rubber tires. There are electric lights inside, and passengers may signal the driver to stop by pressing a button. Storage batteries concealed under seats furnish the power, which is sufficient to cover twenty-five miles on level roads without recharging. The omnibus has a speed of nine miles an hour. The total weight of the vehicle is 5,500 pounds. It took the automobile 'bus just one hour and seven minutes to make the trip from Eighty-eighth street to Washington Square and back, whereas with the stages now in use the run usually takes one hour and fifty minutes.

WE learn from our New Orleans exchanges that the score of magnificent floats which will compose the already much talked-about electric parade of Nereus in the Carnival of 1900 are now practically completed and the success of the undertaking is a foregone conclusion. All the multiplied and intricate mechanical and electrical problems which presented themselves in the course of the work have been met and overcome. There is no possibility that some unforeseen hitch will do naught to obscure the splendor of Nereus' arrival.

An Associated Press dispatch from Baltimore is authority for the statement that "Dr. Henry A. Rowland, professor of physics at Johns Hopkins University, seems to have discovered the cause of the magnetism of the earth. He has been experimenting for about a year, using a wheel wound with miles of fine wire and revolving on a shaft run by a motor. About the wheel is a casting or sheath of brass, with an air or ether space between it and the circumference. The whole represents the earth with its atmosphere. By revolving the wheel magnetism is produced in the wire. Dr. Rowland is now working to show that the faster the revolution the more the magnetism. He believes that the earth and heavenly bodies produce the magnetism in same way."

A London contemporary states that Mr. Kennedy, who went to the Transvaal as the representative of the Wireless Telegraph Company, has arrived at Modder River. He is said to have made most successful experiments in the transmission of wireless messages between Orange River and De Aar, a distance of seventy miles

ONE of the latest uses of electricity is its application as a headlight in the canes of gentlemen who for one reason or another find themselves out late at night. The new "pathfinder," as the electric cane has been called does not differ in appearance from the ordinary walking stick. In the head of the "pathfinder," however, is fixed a small but powerful electric light covered by a shield which can be instantly released by a pressure of a button near the head. Behind the light is a strong reflector, so that the light in action is really a miniature searchlight. It is anticipated that the "pathfinder," will be popular with men whose business or other engagements make it necessary for them to go home late at night.

The calcium carbide manufacture in Sweden is rapidly increasing. Not only is the Trollhättan factory, which for some time was the only one in Sweden, being extended, but, according to Engin-ering, London, new works have been erected at Alby. Mansboand Brattfors, the first of which has already commenced operations.

This will bring the annual production up from 1,000 to 6,000 tons. As the home consumption in Sweden was only about 100 tons last year the bulk of the calcium carbide is intended for export, although no doubt the requirements of Sweden herself are likely to increase materially.

A French physicist states that from the experiments he has made he has ascertained that selenium is not acted on by Hertzian waves in the atmosphere as it is by light, in that even in the presence of these waves its electric resistance is unaltered.

The average life of first-class leather belting. running indoors and under ordinary conditions, is ten years, says the N. Y. Sun. Belts subjected to acid fumes would last a much shorter time than that; and on the other hand in especially favoring circumstances a belt might last much longer. There was taken down in New York not long ago a leather belt that had been running twenty four years; this, however, was something unusual. As is the case with pretty much everything that is made and sold, leather belting may be bought second-hand, the second-hand belts coming into the market naturally enough through the refitting of factories, through the substitution of belts of one width for those of another, and so on. Secondhand belts that have not been much used sell for not very much less than new belts; their price decreases, of course, according to the wear to which they have been subjected. When a leather belt ceases to be useful as a belt it is likely to be sold to be cut up into boot heels what there is left of it after that going to the scrap heap.

## LIEUT. S. DANA GREENE AND WIFE DROWNED.

## They Were Skating on the Mohawk River Near Schenectady.

On Monday afternoon last while skating on the Mohawk River near Schenectady, N. Y., Lieutenant S. Dana Greene and his wife, a daughter of the late Rear Admiral Chandler, U. S. N., lost their lives. Ice had been removed from a section of the river and not being aware of the fact the unfortunate couple skated on to the thin ice, broke through and were drowned before help could arrive.

Both Mr. Greene and Mrs. Greene were extremely popular and their untimely death has cast a deep gloom over the city of Schenectady. Mr. Greene was well known to the electrical fraternity, and had been connected with the General Electric Company for a considerable length of time. He was the son of the late Commodore S. Dana Greene, who succeeded to the command of the Monitor after Admiral Worden was disabled in the famous fight with the Merrimac during the Civil War.

Lieutenant Greene was educated at the Naval Academy of Annapolis, but after a short period of duty at sea he resigned and became interested in electrical undertakings. When the war with Spain broke out Lieutenant Greene volunteered his services, and was made executive officer of the auxiliary cruiser Yankee. Mr. Greene was an active member of the Institute of Electrical Engineers, and has from time to time contributed valuable papers to its proceedings.

The untimely and sudden death of Mr. and Mrs. Greene will be deeply deplored by all who were fortunate enough to be honored with their acquaintance

#### THE FUTURE OF ELECTRIC ILLU-MINATION.

BY JEAN WETMORE.

#### PART H.

The war between electricity and gas is much like that between armor plate and guns.

Up to the present time electricity has had the lead, but the late improvements in Welsbach and other burners make the strife more interesting and more evenly balanced.

It is better at this time that electricians have a discussion of the vulnerable features of their systems of illumination and recognize the strong points of their adversaries, that they may make improvements, than to place too much confidence in past successes and ignore the strong points and the recent successes of the gas people.

The object of this article is thus briefly stated

To carry the lighting agent to the lamps we must have conductors of high priced copper and great conductivity: a No. 14 wire is the smallest size allowed by the Underwriters, with a possible exception for lamp cords and electroller wire: while for interior work the conductors must be rubber covered and the copper must be tinned to prevent the vulcanized rubber from corroding the wire; then the insulation must be braided or cloth tapped to preserve the rubber from injury by abrasion: then this tinned copper, rubber insulated and braided conductor must be drawn through a conduit of tar-soaked paper or other suitable material, and this tube must likewise be protected by an armor, usually an iron tube, to keep the lime from eating the paper, the water from making pulp of it, and destroying the insulation and the sulphurous acid from lessening the conductivity of the wire by corrosion.

This is almost as bad as the benighted Oriental's idea of cosmogony, of the world resting on the back of an elephant, the elephant standing on the back of a turtle, and so on ad infinitum.

Compare all this electrical clap-trap with a plain iron pipe for gas, which for simplicity is unexcelled,

We can not allow of there being a conspiracy between the electrical supply and the manufacturing people, to enrich themselves by increasing the cost of electric installations, by trading on the gullibility of the friends of electrical illumination, for by so doing they would readily perceive that they would finally kill the electrical goose that lays the golden dollars.

It is interesting at this point to review the causes leading up to this complicated and expensive state of affairs.

Briefly stated, the principal cause has been due to a lack of common sense, foresight, and also the incompetency on the part of the electric staff of the various boards of Fire Underwriters.

For a full tenth of a century the writer unceasingly contested for high grades of durable insulation and simplicity of construction, but those in high authority were not willing to let good enough alone, and business houses of high reputation have relegated themselves to mediocrity, and the battle was lost.

Fifteen years ago there were rubber insulations on the market that could be safely buried in concrete or plastered in as permanent fixtures of a building; those insulations would

stand water, lime, acids, alkalies, rough usage, heat and cold, and some of our older buildings after fifteen years will show these insulated wires in as good a practical condition as when first installed; but we have no such grade of rubber insulation being installed to-day, and for this reason there are no old rubber boots and shoes lying around.

Good quality and durability in insulation have commercially been sacrificed in general practice to shoddy and cheapness.

Reliable manufacturers traded on the reputation of their products, and deceived their customers for temporary gains, that they might kite stocks, form combinations and by sharp practice skin the confiding foreign investors; thus the result well exemplified in Abraham Lincoln's well known saying, "You may fool all of the people part of the time and part of the people all of the time, but you can't fool all of the people all of the time."

Again the Underwriters have not encouraged the best products or the improvements in the same. They have ever taken the ground of strict impartiality, recognizing no differences, and they made their rules and requirements to guard their own interests against the failings of the worst class of material, and for this reason mainly we are unable to-day in common practice to find a rubber insulation being installed that will resume its original contour when firmly compressed, or will stand reasonable torsion, without breaking, even when fresh from the shop.

The Underwriters demand a certain thickness of material regardless of quality, with a result that our rubber for insulation purposes much resembles a good quality of tenacious baked mud.

(To be continued.)

## ELECTRICITY SUPPLY FROM CENTRAL STATIONS.

Covering Recent Developments in the Construction and Operation of Stations in New York.

[The following is a summary of the address delivered by Mr. J. W. Lieb, Jr., before the New York Electrical Society, Dec. 21, 1899.]

The speaker opened his remarks by a reference to the extent and character of the territory included within the limits of Manhattan Island, pointing out that this field presents nearly all of the varying conditions of electricity supply, covering many of the problems connected with the generation and distribution of electricity for lighting and power purposes.

After a brief review of the history of the electric lighting industry previous to the starting of the old Pearl street station of the Edison Company, an interesting picture was presented of that pioneer lighting station, including reminiscences of the early difficulties encountered in the construction and operation of the station machinery and how they were successfully overcome. Some interesting maps were shown, including maps of the original underground system, diagrams illustrating a house-to-house canvass made by Mr. Edison. showing all the gas light and power users in the district, and a map on which future distributing stations are laid out, covering all the territory up to Central Park, within which thirty-eight distributing centers were located.

Series of curves were presented, showing the development of the business of the New York Edison Company from '83 to date, including

curves of income, load, connected installations, etc.

The loads carried by the several stations connected to the system were shown by varicolored curves, and explanations were given of the character of the business in each district as reflected in the peculiarities in the forms of the curves. Parallel curves, exhibiting the variations from month to month and from year to year, formed a graphic indication of the effect of the season and the variations in the hours of the rising and setting of the sun

A sectional plan was shown of the waterside station now being constructed between 38th and 39th streets and the East River, by the New York Gas and Electric Light, Heat & Power Company.

The equipment of this station, covering a plot 190 x 273 ft., was described in detail and data was given of the efficiency which it is expected to obtain from the engines, generators, etc. The complete plant will consist of sixteen three-crank compound condensing engines, 75 revolutions per minute, and developing each 5,200 indicated horse-power at most economical cut-off, and nearly 10,000 hp. at maximum power. Each engine will be direct connected to a three-phase generator operating at 6,600 volts and rated at 3,500 kilowatts, but capable of operating with a load of 4,500 kilowatts for three hours.

Fifty-six boilers, each of 6,400 square feet of heating surface, will furnish the steam supply and it is proposed to equip the boilers with super heaters in addition to the usual complement of automatic stokers, feed water heaters, feed pumps, etc. The products of combustion will be discharged into four steel stacks, each 19 ft. in diameter and 196 ft. high above the grates, supplemented, when necessary, by forced draught from fan blowers.

A map of the extensive underground system supplied with current from the Edison Company and by the companies associated with it, under the administration of the New York Gas and Electric Light, Heat & Power Company, was shown, for which the water-side station is to furnish the main current supply.

A number of rotary converter stations now in course of construction at Horatio street, West 84th street, East 121st street, and West 124th street will be equipped with rotary converters and storage batteries, permitting of an extension of the direct current underground system into new and hitherto unoccupied territory, and, together with rotary converter equipments at several of the present generating stations, will afford at once a considerable outlet for the high tension three-phase current generated at the water-side station, enabling also some of the less economical generating apparatus to be put out of commission and to be used during only a few months of the year on the peak of the load. The speaker then briefly touched on some details in the method of distribution in future of series are lighting, rectifiers, etc., which the lateness of the hour made it impossible to consider at length.

#### Another Cable to South Africa.

The Western Union Telegraph Company reports that the cable recently completed from Cape Town to St. Helena has been extended to Ascension Isand. It is expected that the cable will be extended north forming another route to South Africa. The line is expected to be completed about the end of the coming March.



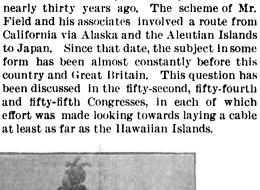
## NOTES ON THE FORMATION OF COPPER "TREES" AND "NODULES."\*

BY SHERARD COWPER-COLES.

Everyone who has electro-deposited copper, either on a laboratory or commercial scale, must have experienced great difficulty in preventing the formation of copper "trees" and "nodules," and must have noticed the different formation obtained under apparently the same conditions. No systematic work appears to have been done to determine under what conditions copper "trees" most rapidly grow, or what conditions vary their formation. Mr. J. W. Swan found that regularity and smoothness of deposit was almost entirely dependent

posited was of a good salmon color and crystalline. In all cases the cathodes were placed on edge to the anodes, there being a space of from ½ in. to 2 in. between them, the anodes being of sheet copper The potential difference between the terminals of each cell was from 2.4 to 2.8 volts. The solution employed contained 25 oz. of copper sulphate to the gallon of water, to which was added various percentages of free acid.

A fine "nodule" was obtained from a solution of copper sulphate containing about 30 oz. to the gallon of, water and 12 oz. of free sulphuric acid, the current density being 15 amperes per square foot of cathode surface, the cathode being revolved at about 17 revolutions



AN AMERICAN PACIFIC CABLE.

BY GEORGE OWEN SOUIER.

trans-Pacific submarine cable was first discus-

sed and considered by the late Cyrus W. Field,

It is interesting to note that the idea of a

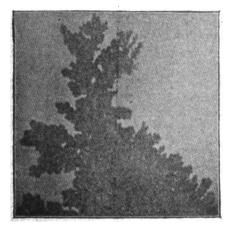


Fig. 1.—Copper Trees from Neutral Solution.

on the absence of solid particles held in suspension in the electrolyte, and that excrescences could be entirely avoided by taking care that the electrolyte was free from solid floating particles. He observed that at the seat of each nodule was a speck of some foreign substance.

Dr. Gore has given the matter some thought, and has observed that the greatest length of "nodule" is in the direction of the greatest intensity of current and amount of copper in

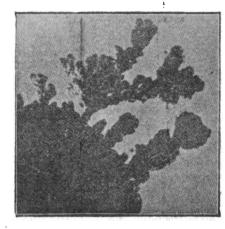


Fig. 2.—Copper Trees. Solution containing free H<sub>2</sub>SO<sub>4</sub>—6 oz. to the gallon.

per minute, the diameter of the disk being 30 in., the "nodule" was removed from the edge of the disk. Fig. 4 illustrates a "tree" obtained under similar conditions. Fig. 5 shows the apex of a copper cone deposited from the same solution, the cathode making about 10 revolutions per minute. Fig. 6 shows a copper cone deposited under the same conditions, making about 32 revolutions per minute. In the one case the surface is covered with a mass of



Fig. 3.—Copper Trees. Solution containing free H<sub>2</sub>SO<sub>4</sub>—10 oz. to the gallon.

In a special message to Congress, dated February 10, 1899, the President says:

"As a consequence of the ratification of the treaty of peace between the United States and Spain, and its expected ratification by the Spanish Government, the United States will come into possession of the Philippine Islands, on the farther shore of the Pacific. The Hawaiian Islands and Guam becoming United States territory, and forming convenient stop-

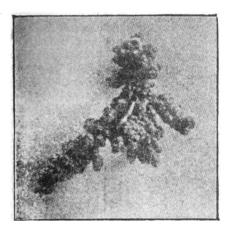


Fig. 4.—Copper Trees from Revolving Cathode.

solution. The author has tried the effect of various current densities, strength of solution, acidity of solution and temperature, and cathodes of various shapes. The three photographs above (Figs. 1, 2 and 3) show the formation of copper "trees" or "nodules" in a neutral solution and solutions containing various percentages of free acid. The inital current density in each case was from 60 to 70 amperes per square foot. This was found the best for the growth of copper "trees"; the copper de-

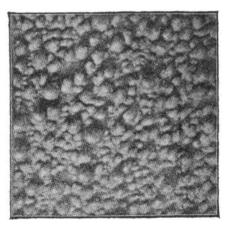


Fig. 5.—Deposit of Copper, Cathode making 10 revs. per minute.

small "nodules," and in the other case the rotation lines can be distinctly seen, the cross lines being caused by a change in the direction of rotation, which took place about every 15 minutes; the current averaged about 15 amperes per square foot.

The Canadian Power Company of Niagara Falls, Ont., has changed its name to the Dominion Power Company. This company has a franchise for the operation of its plant from the Dominion Government to take water from Chippewa Creek for power purposes.

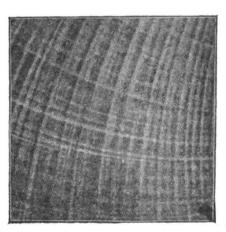


Fig. 6.—Deposit of Copper, Cathode making 32 revs. per minute.

ping places on the way across the sea, the necessity for speedy cable communication between the United States and all these Pacific islands has become imperative. Such communication should be established in such a way as to be wholly under the control of the United States, whether in time of peace or of war. At present the Philippines can be reached only by cables which pass through many foreign countries, and the Hawaiian Islands and Guam can

<sup>\*</sup>Abstract of paper read at the meeting of the American Institute of Electrical Engineers, New York, December 27, 1899.



<sup>\*</sup> From the Electrician, London.

only be communicated with by steamers, involving delays in each instance of at least a week. The present condition should not be allowed to continue for a moment longer than is absolutely necessary."

The idea of a British Pacific cable, connecting the Dominion of Canada with the Australasian colonies, almost from the first has been discussed from a national standpoint. Majesty's Government and the Colonial Governments most concerned have been nrged from time to time to consider the matter in its strategic and commercial aspects. Two colonial conferences, in 1887 and 1894, were largely occupied with this subject, as evidenced by the exhaustive blue books which record their proceedings. The Dominion Government took the matter up in 1893-4, and invited the most reputable firms in the world to submit estimates for construction and laying.

In 1896, Mr. Chamberlain, Secretary of State for the Colonies, appointed a Pacific Cable Commission, which included among its members the Under Secretary of State for the Colonies, the High Commissioner of Canada and the Agents-General for New South Wales and Victoria. This committee went into the whole subject of the practicability, cost, probable revenue, and management of the proposed enterprise and elicited a fund of technical, commercial, and professional information upon cable manufacture and cable laying in general, and upon this important project in particular, which is invaluable, and which probably could not have been obtained in any other manner. At this moment a Pacific cable touching only soil belonging to Great Britain is assured, both Canada and Australasia recently having been reported as joining with England in pledging themselves to the enterprise as a Government undertaking.

The proposed route is from Vancouver to Fanning Island, thence to the Fiji Islands, thence to Norfolk Island, and from there bifurcating to New Zealand and Queensland.

Since a Pacific cable will at last complete the telegraphic circuit of the globe, it will give the peculiar advantage of placing each point thereon in cable connection with every other point by two distinct routes either east or west.

The cardinal idea in the British system has been that all state cables shall touch only British soil, and this principle has placed British cable traffic in the Pacific forever at a disadvantage over the American cable for the reason that the only available route involves a single span of cable from Vancouver to Fanning Island, over 3,500 miles in length; whereas, by the annexation of the Hawaiian Islands, the United States, while following a similar principle, will have no span longer than the present Atlantic cables, or about 2,500 miles in length.

Since the speed of cabling decreases in general with the square of the length of the cable, and the speed of the whole system is limited by the speed of the slowest span, that system requiring the longest single span is ultimately at a disadvantage, provided the systems are in direct competition. In the projected Pacific cable enterprises, however, although, as will be pointed out later, they will operate in close relations with each other, yet each has a sufficient prospective traffic to guarantee the enterprise as a sound financial success from the beginning.

AMERICAN CABLE ROUTES.

In the consideration which, from time to time, has been given the project of spanning the Pacific Ocean by a submarine cable, the Northern route, via Alaska, the Aleutian Islands, Siberia and Japan has been frequently proposed.

In recent years the British Government, in its proposed line from Canada to Australasia. first projected this northern route owing to the absence, at that time, of information respecting the Southern Pacific Ocean, and the impression which prevailed that physical difficulties existed which offered insuperable obstacles to the laying of a cable on a direct route between Canada and Australasia. In consequence of this impression it was designed to lay the cable from Vancouver to Japan, touching at islands in the Aleutian and Kurile groups as mid-ocean stations. From Japan the connection with Australasia would have been obtained via Singapore and the Eastern Extension Company's lines of telegraph. Through the intervention of the Government, negotiations were opened with the view of securing one of the Kurile Islands. Japan was asked to transfer to the British crown one of these islands in order that the telegraph station should be under British protection, and an agent was sent to Washington who, after some difficulty, obtained conditional landing privileges on one of the Aleutian Islands.

Recently there has been a revival of interest in this route, especially now that the growing commercial interests of Alaska are becoming important. The plan proposes starting from Cape Flattery, thence to Sitka, distances (approximate) 803 miles; thence to Kadiak Island, 682 miles; thence to Dutch Harbor, 770 miles; thence to Attu, 810 miles; thence to the Japan-Russian border, 858 miles; thence to the Japan-ese land lines, 810 miles; from the Siberian border to the Siberian lines, 617 miles; and from Formosa to Luzon, 200 miles; in all 5,550 nautical miles, exclusive of the Japanese system.

It will be noticed that this series of cables aggregating 5,550 miles makes no provision for American communication with the Philippines, except over the Japanese land lines from the north point of Japan to the south point of Formosa, a distance through a foreign territory of about 1,200 miles. Owing to the uncertainty of the Japanese land lines, which are frequently interrupted during the typhoon season, particularly in Formosa, it would be necessary, in order to insure communication, to extend the Japanese cable system. Again, the Great Northern Telegraph Company, a Danish corporation, has exclusive rights, not only on the Siberian coast but also between Japan and the Asiatic coast.

Apart from establishing telegraphic communication free from foreign control between the United States, the Hawaiian Islands, the Philippine Islands and the island of Guam, the mission of an American Pacific cable should be to bring about a general reduction of cable rates.

On the Alaskan route, a large number of intermediate stations must be established and maintained; and there must be a division of receipts with Japan. A message via Honolulu, an intermediate island station and Guam, would reach Luzon by four cable transmissions. The Alaskan route as proposed would necessitate about fifteen separate stations, of which nearly one-half would be under Japanese control.

Undoubtedly an Alaskan cable will soon be required, and apparently also the extension of such a cable system as a means of attaining a through line to the Philippine Islands is an attractive plan. This plan, however, leaves the United States in practically the same unsatis-

factory position she is in at present in respect to communication with her Pacific possessions, and until definite and perpetual concessions are forthcoming, can furnish even no guaranty of substantial reduction from the present high rates

It is believed that no one studying the true present and future interests of the United States can come to any other conclusion relative to an American Pacific cable, than the one so admirably expressed by the President in his special message to Congress, viz., that this cable shall be "wholly under control of the United States."

This cardinal idea- the principle also adopted by Great Britain, after years of exhaustive consideration—at once excludes the northern route for the present, and limits the route to American territory.

#### PRACTICABILITY.

There is no longer any doubt as to the practicability of the Pacific cable project from a technical and engineering point of view. A preliminary survey between the coast of California and the Hawaiian Islands was completed by the Navy department in 1892, showing the entire practicability of this part of the route. Between California and the Hawaiian Islands several approximately parallel routes are practicable, but the one which seems to be favored by the survey of 1892, as shown in the report of the Hydrographic office of the Bureau of Navigation, is a rhumb-line between Monterey Bay and Honolulu on Oahu Island. The U.S.S. Nero, under command of Commander Charles Belknap, U. S. N., has been engaged since April last in a survey of the bed of the Pacific along the proposed route of the cable from the Hawaiian Islands westward to the Philippine Islands and to Japan. A preliminary report of this survey, recently received, adds greatly to the knowledge of this part of the Pacific and to the data necessary before determining the exact route of the cable. This survey develops two unusual physical features along the route via Midway Island, one of these is a submarine mountain, situated a short distance westward of the Midway Islands and rising from the floor of the ocean, having a depth of 2,200 fathoms to within 82 fathoms of the surface. The second feature is one of the deepest submarine abysses yet found in the world, situated about 500 miles eastward of Guam and more than 4,900 fathoms in depth. These and other obstacles which may be found, however, can be avoided in laying the cable by making suitable detours around them as is ordinarily done.

### A MID-OCEAN ISLAND CABLE STATION.

The great decrease in speed and increase of cost consequent upon increase of length of a single span of the cable, requires a landing station, if possible, between the Hawaiian Islands and Guam. The longest cable yet laid and in operation is the French cable from Brest, France, to Cape Cod, Mass., which is about 3,250 nautical miles in length, and there is no question that a cable directly connecting Honolulu and Guam could be successfully laid. if no practicable landing place between these points could be obtained. This single span, however, about 3,650 nautical miles including "slack," would for all time so reduce the through speed of the cable, and so increase the original cost, as to warrant unusual expense, if necessary, in preparing and maintaining an intermediate station. In this connection the large amount of technical evidence given before the British Pacific Cable Committee relative to the Vancouver-Fanning Island span,



which is practically the same extreme length of 3,600 nautical miles, and of the utilization of Fanning Island as a station, are valuable as showing entire practicability. Although both Wake and Midway Islands, which have been proposed as stations, are low atolls, rising but a few feet above high water and with little to sustain human life, yet either of these places is equal, if not superior, to Fanning Island. Further careful surveys will be necessary before the exact route west from the Hawaiian Islands to Guam can be finally determined. Fortunately for this enterprise, the annexation of the Hawaiian group brought under the sovereignty of the United States eleven or twelve small, rocky or sandy islands extending to the northwestward about 1,800 miles from Honolulu. These must be surveyed and considered from the cable standpoint before a final selection of route can be made.

The distances in nautical miles along two provisional routes, including ten per cent, for "slack" in laying, are as follows:

San Francisco to Honolulu	2,286	miles,
Honolulu to Midway Island	1,254	••
Midway Island to Guam	2,523	••
Guam to Dingala Bay, P. I	1,496	4.
Total via Midway Island	7.559	
San Francisco to Honolulu	2,286	miles,
Honolulu to Wake Island	2,205	4.
Wake Island to Guam	1,435	
Guam to Dingala Bay, P. I	1,495	
Total via Wake Island	7,422	**

#### COST, MAINTENANCE AND OPERATION.

The cost of laying cable depends mainly upon the materials used in its construction, and therefore fluctuates with prices current. The outer coverings are much the same in all specifications, according to the conditions of the case, but the copper conductor and the gutta-percha insulation vary with the speed required over the cable. Since the length of the longest section of the proposed Pacific cable is approximately equal to each of several of the Atlantic cables, the type of the cable to be used for this section, and the speed obtainable are subject to a close estimation.

Of the eleven cables spanning the north Atlantic, the Anglo-American Company's cable laid in 1894, and the Commercial Cable Company's cable No. 3 laid also in 1894, have the greatest speeds. The former contains 650 lbs, of copper and 400 lbs. of gutta-percha, and the latter 500 lbs. copper and 320 lbs. gutta-percha per nautical mile. Either of these types of cable would give good results and no cables of less equivalent speed should be considered.

The following conservative estimate is made from the evidence obtainable relative to the establishment of this enterprise by the Government on a sound financial basis:

#### MAINTENANCE AND REPAIR PER ANNUM.

Annual expenses of two cable repair ships	\$200,000
Annual expense for new cable, assuming entire cable	
to be replaced in 40 years, or 200 miles per year	200,000
Working expenses	125,000
Reserve fund and interest on capital	400,000
Total net earnings of cable required	\$925,000

This provision for laying 200 miles of new cable per year should perpetually maintain the value of the cable as an asset, and the reserve fund further provides that the entire capital shall be replaced at the end of fifty years, or what is equivalent that a sinking fund shall be established, which, at the end of fifty years will be sufficient to lay an entire new cable in addition to the permanent maintenance of the original one, so that at the end of fifty years two working cables will be provided for.

Taking average conditions for long cables ten

years ago, the annual expenses for maintenance and repair, e. g., for new cable required, etc., and not including the fixed expenses such as the repair ships, was about \$30 per nautical mile. The great advancement in cable manufacture since has reduced the average repair rate materially, but assuming this rate as it then averaged, the total charge to this item is practically the same as that given by the independent supposition above

At present there is no first-class cable ship in the world flying the American flag and which would therefore be under the control of the United States in time of war. It should be the policy of the United States, whether the Pacific cable is laid by the Government or by a subsidized company, to require that two complete cable repair ships, one, at least, also capable of laying long cables equal to any yet constructed for these purposes, and flying the American flag, be stationed in the Pacific ocean.

#### PROPOSED MANAGEMENT OF THE CABLE AS A GOVERNMENT ENTERPRISE.

Assuming that the proposed Pacific cable will be established by the Government, opportunity will be presented in this new and unoccupied field of the Pacific, unfettered by precedent and obligations, to introduce such radical changes in the policy and business management of the enterprise as will operate advantageously to the whole people who are directly concerned. and for whom the cable is primarily built, Private corporate management naturally aims at large dividends for its stockholders. It is a matter of statistics that in cabling throughout the long distances involved in the East, out of every one hundred messages sent, ninety-nine are purely commercial in character, and one of private nature. Cabling throughout the world is so expensive that it is only resorted to for urgent commercial purposes. The present tariff rates strictly limit the kind of traffic offered, and prohibit all other than that of the most urgent nature, and are sufficiently high to keep the long cables actually idle for a considerable portion of each twenty-four hours. The enormous volume of the present mails indicate that the world's cable plant could be duplicated many times and all kept full to overflowing if the cable rates were sufficiently reduced.

#### CONCLUSION.

After several years of comparatively little advance, the technical and scientific side of telegraphy has received much attention during the past two or three years, until at this moment there is no other special branch of electrical engineering which is more in evidence or promises more for the future.

By whatever method the first Pacific cable is ultimately laid, and provided that it shall appear that all of the projected cable cannot be manufactured and laid in the United States within a reasonable time, it seems plain that the encouragement of American manufacturers in the building up in the United States of a deep sea cable industry of the first-class is a wise policy for this Government.

The successful completion of the submarine cable across the Pacific will mark an epoch in the telegraph history of the world. After thirty years of consideration-technical, commercial and political—the end of this century sees this great enterprise at last seriously undertaken. The full influence which it will exert upon the Western Hemisphere and the world in general is not easily appreciated. Strategically, the importance of this inter-

colonial communication and its preservation are very great. However, the Philippine question should not overshadow the larger question the Eastern question—in the consideration of this project. Important as the cable will be as a means of joining the Philippine archipelago to the United States, its larger importance will ultimately be in the future of the commercial development between the United States and the East. In the broad extension of the Pacific trade consequent upon the completion of the Isthmian canal and the development of steamship lines plying the Pacific, the telegraph cable will naturally become an important factor. The trans-Pacific steamship lines are heavily handicapped by the absence of a direct means of telegraphy between the ports embraced in their routes. Situated on the main trade routes leading from the Isthmian canal to Asiatic ports, the Pacific cable will serve as a powerful adjunct and support to this enterprise. The two go hand-in-hand and are mutually closely related. It can be stated that there is scarcely any point in the world where there is greater need for a central cable station than in the Hawaiian Islands Geographically situated at the military and commercial strategic position of the North Pacific Ocean, it will ultimately serve as the distributing center of ocean communication between the two hemispheres, as well as to various island groups of the Pacific.

As to the probable traffic to be immediately expected there is little direct evidence at hand. since the waters spanned have never before been crossed by a submarine cable. Taking \$150 as the average earning power per nautical mile of the long cables of the world as a basis, this project should prove a paying investment from the very first, but it is believed that this estimate, based upon the average of cables, will prove under rather than above. particularly as this route will immediately enter as a competitor for European traffic via the Atlantic cables and United States land lines. The immediate effect of the trans-Pacific cables will be to lower the rates to the East. since European traffic will be open to competition, east and west, and the new Western route, due to the long spans and comparatively few repetitions will have an advantage.

A short span of cable of about 200 miles between Luzon and Formosa connecting with the Great Northern Telegraph Company's route through Siberia and also between Luzon and a Chinese port will bring Japan and China into direct connection not only with the North American Continent, but also by two competitive routes east and west with Europe. In fact, the laying of the Pacific cable should operate to readjust the present cable through tariff rates throughout the world upon a lower basis.

#### Electrical Activity in Germany.

In a communication to the N. Y. Times Mr. James C. Monaghan, United States Consul at Chemnitz, states that in electricity and electrical appliances, Germany leads Europe, if not the world. She has 711 miles of electric railroads, or more than all the rest of Europe combined. England has only 98 miles. All the large towns have electric roads, and by 1901 Berlin will not have anything else. New roads are being projected in almost every city. The movement back to the country, so characteristic of our own people, has reached Europe. The Patakys, well-known patent lawyers of Berlin, wrote recently as follows: "The outlook for American manufacturers in Germany is perhaps brighter than in any other European

#### EWING'S SINGLE-RAIL TRAMWAY.\*

The accompanying figures illustrate the single-rail tramway invented by Mr. Charles Ewing. The special advantages claimed for this system are simplicity, cheapness, speed of construction, and small tractional resistance.

Quoting from a paper read before the United Service Institution of India by Lieut. Col. F. F. R. Burgess, I.S.C.:

"On a level road one pair of bullocks can, on a single line, draw a train of trucks, carrying a net load of from six to seven tons, a distance of 15 miles in a day with ease; it requires from 16 to 18 pairs of bullocks to draw this load in ordinary carts carrying the military regulation 800 lbs. load.

"The trucks run on a single line of rail laid on the ground or roadway, and are mounted on two or three double-flanged wheels placed under their center. These wheels are of small diameter, varying from 15 to 30 inches, according to the size and weight of the trucks and rails, the flanges being twice as far apart as the width of the head of the rail on which the wheels run.

"The whole weight of the truck is thus borne on two or three double flanged wheels which run on the single rail, so that, unless it was supported in some way, it must fall over. The necessary support is afforded by a lightly constructed iron 'balance' wheel of comparatively large diameter, from four to five feet, with a four inch wide tire, placed at the side of the truck.

"This balance wheel runs on the surface of the ground or roadway about 4½ or 5 feet away from the rail. It runs on an axle which is pivoted at right angles to the center of the truck and is kept in position by a hornplate fixed to the frame of the truck. The axle is also furnished with a double helical spring which eases the jolting of the balance wheel when going over any inequalities. The platform of the truck, which carries the load, extends to an equal distance on each side of the central line of the truck over the rail and flanged wheels, and the load would usually be evenly distributed on it, but should it not be so, there would be no risk of the truck upsetting, as the balance wheel provides against this, and an excess of several hundredweight may be placed on the far side, away from the balance wheel, without risk. This is due to the fact that the balance wheel is placed at a considerable distance away from the side of the truck, generally 5 feet from the center of the light 1 ton truck, which has a 6 foot wide platform, and the leverage thus afforded enables a light balance wheel of only about 160 lbs, weight to balance more than three times its own weight of excess load on the far side and thus allow for careless loading, etc.

"The balance wheel does not bear any of the weight of the load on the truck, and but a very small proportion of the weight of the truck itself, and, therefore, causes very little loss of power through frictional resistance, especially on a smooth surface.

"The axle of the balance wheel may either be straight or cranked; in the latter case it goes under the platform of the truck, leaving it perfectly flush and clear for the load, which is an advantage: but for certain purposes it may be better to have the other pattern, which allows of the center of gravity being considerably lowered, as the platform can be made

very low, only 8 inches above the road suface, if required.

"The truck runs very smoothly, and requires very little force to start it on level ground. It is strongly but lightly constructed of teak or other suitable wood, and is fastened with iron nuts and bolts. It is very light in proportion to the load it is intended to carry, which itself is only limited by the weight of the rail and

ing roads are laid on small wooden sleepers to which they are spiked in the usual manner. These sleepers are 18 inches long, 8 inches wide and 3 or 4 inches thick."

There is no keeping the rails in gauge as in a double line, and it does not matter if the rails shift a little, a serious matter with a double line; the cars can be run with ease round curves of 25 feet radius, or even less.

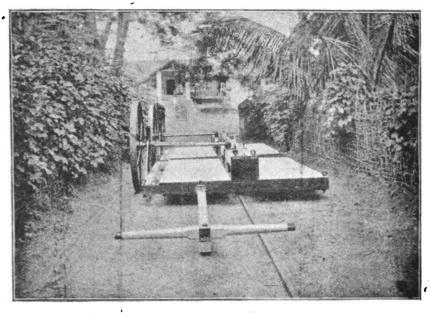


Fig. 1

the description of rolling stock carrying it."

Fig. 1 is a front view and Fig. 2a side view of a pair of empty trucks to carry 3½ tons each.

"The rails used on this system are of the ordinary railway description, and their size and weight vary according to the work required; for instance, in the light planter's line on this system, such as that on Messrs. Finlay,

To enable trains of cars to pass each other, each truck carries a ramp fitting the head of the rail, attached to a single rail; when two trains meet, these spare rails are used to make a temporary siding, on which one of the trains is run.

Bullocks are generally employed for haulage; but two men can easily propel a truck carrying a load of 1 ton at a walking pace. Various pas-

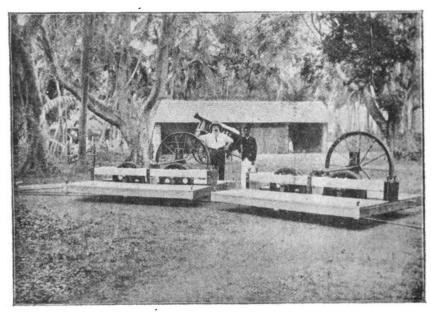


Fig. 2.

Muir & Co.'s estates in the Travancore Hills, some 22 miles in length, the rail used weighs only 14 lbs. to the yard, the two-wheel trucks running on it carrying loads of 1 ton each, this light rail being only intended to bear the gross weight of three-quarters of a ton per wheel: but where heavier loads are required to be carried on larger and heavier trucks, a heavier rail would be necessary.

"Single line rails for ordinary use on exist-

senger cars, ambulances, etc., have been designed for use on this system.

The application of electric haulage to a line of this description appears to present no difficulties. A light trolley line carried on wooden brackets, and locomotives of similar design to the trucks, would afford a cheap equipment suitable for light traffic on either a temporary or a permanent line. Working on the principle of small loads at frequent intervals, electricity

<sup>\*</sup> From the Electrical Review, London.

would be at its best, and would compete favorably with any other mode of haulage.

#### TO COMPETE WITH AMERICANS.

#### An English Electrical Scheme with Prof. Sidney Short as Engineer.

The establishment of a plant for the manufacture of electrical traction equipment on a large scale in England, with the avowed object of meeting all comers, is of interest to American manufacturers. F. H. Armstrong, one of the chief engineers of Dick, Kerr & Co., Ltd., the large English electrical engineers and contractors, is now in this country looking up the latest American innovations in electrical apparatus, with a view to making additional purchases of equipment for the large plant which is being built for the English Electrical Manufacturing Co. at Preston, in the vicinity of Liverpool. In conversation with a representative of the New York Commercial Mr. Armstrong said:

"The new plant, which will be equipped with the most up-to-date American machinery, consists of three main buildings, the machine shop, the foundry and the power house. The total area under roof is 182,260 square feet, or about four and a half acres. In the buildings there will be nearly 400 of the latest American automatic machine tools, which have been designed especially for the manufacture of electrical machinery.

"The general arrangement of the buildings and machinery will be such that the raw material will move continuously from the receiving end to the testing and shipping departments, from which it will emerge as a finished product.

"The works will employ 4,000 hands; British workmen only will be employed.

"At the outset it was recognized that such an undertaking could only succeed in competition with American manufacturers by frankly making use of American experience and skill, hence the first step that the promoters of the enterprise undertook was to find the right man to manage the concern. The services of Prof. Sidney H. Short were secured. Prof. Short was lately chief engineer of the Walker Company of Cleveland, and is considered to be one of the greatest living electrical engineers of to-day.

"The second step was to carefully study the best and latest American practice, and for this purpose the promoters visited the United States.

"Thirdly, it was felt that only by entering into competition on a very large scale could success be achieved, for without being able to command a similar output to the great American firms the English venture would be at a conspicuous disadvantage.

"Preston was chosen as the site of the new works, owing to its rail and shipping facilities and its contiguity with the supply of coal and iron.

"Now for the market. In the first place, the new company believes that it can successfully compete for British contracts at home, and it counts upon a largely increased demand from this source during the next few years.

"In the colonial market the promoters of the plant believe that the fact that the great trade routes are to and from Great Britain will give them an advantage against rivals who must tranship at a British port.

"On the Continent there is also a large field. In brief, the field embraces the world with the

single exception of the tariff-protected United States."

On being asked if he could give any reason for his belief that the new enterprise could compete with old-established American companies, Mr. Armstrong said: "Certainly. We shall have the benefit of other people's experience without paying for it. The great electrical manufacturing firms in America have reached their present state of perfection only after a long course of costly experiments. Expensive machinery has been bought and cast aside, and the works have been remodeled again and again. Hence for the business they are now doing they are vastly overcapitalized, and that deadweight of expended capital will give us a considerable advantage.

"Then, too, their lack of continuity, owing to combinations and trusts, is a source of considerable weakness. A continental firm had for years been purchasing goods amounting to close on \$1,000,000 per annum from an American concern. One day my friends were suddenly informed that the American firm had ceased to exist. It had been absorbed in a gigantic concern and had closed down. At one stroke the continental firm's whole business was thus gone, current orders were not executed, and they could never obtain any of the parts needed to repair the machinery which was installed in their plant."

Over \$300,000 worth of equipment for installation in the Preston works has already been purchased in the United States and Mr. Armstrong anticipates the placing of contracts for machine tools of at least \$100,000 during his present trip.

#### THE MUNICIPAL ELECTRICIANS.

## They are Arranging for an Important Convention at Pittsburg.

Capt. William Brophy, of Boston, president of the International Association of Municipal Electricians, had a conference with the executive committee of that association at the Hotel Imperial in this city last week, and outlined the plans for the annual meeting to be held in Pittsburg.

Mr. Morris W. Mead, chairman of the executive committee, promises something interesting in the way of papers to be read. He said:

"Our president, Mr. Brophy, has sent out several hundred circular letters to the heads of the departments of electricity in this country and Canada asking for opinions as to what are considered the most important problems that now confront the municipal electricians,

"The idea in this is to get them interested and bring them together for mutual improvement, with the final benefits, of course, to ge to the municipalities which they represent.

"Though no definite arrangements have been made for the convention, several important questions will come up for debate. There is one point on which we all seem to agree, and that is that all of the different bureaus of electricity in a city should be combined under one head, making that head responsible for their handling. The different branches are divided now, and there always is a question of responsibility that cannot be decided.

"Another thing of interest will be a discussion on contact points. This question is creating a great deal of interest just now because of the innumerable new and surprising uses of electricity. Safety from fire and protection from injury or death from shock will form a

large part of that discussion, as the protection of property and human life necessarily depends largely upon proper insulation.

"Electrolysis may come up for discussion and I consider its study intensely interesting. Certainly a grave problem is presented where a municipality finds its vast systems of gas and water pipes and all iron underground being eaten away by that queer little 'electric bug.' If we knew how to prevent electrolysis economically we would know how to prevent the leakage of electricity, but we haven't reached either point perfectly. It will be a great day, indeed, when we are able to produce energy at one point and transmit it, no matter how many miles, in its original force, without the loss of an ounce."

#### ELECTRICITY DRIVING OUT GAS.

#### The Real Cause of the Rockefellers Buying the Light, Heat & Power Company.

(From the N. Y. World, Jan. 5.)

It developed yesterday that one of the objects of the purchase of the New York Gas and Electric Light, Heat and Power Company by the Consolidated Company was to materially increase electric lighting among private consumers.

The demand for electric lighting in residences has grown tremendously within the past year, and those familiar with the situation say that gas will soon be a secondary factor as an illuminant in the city.

The growth of electrical lighting has cut into the business of the gas companies considerably, and of late it has assumed such formidable proportions that the Rockefellers have been forced to recognize it.

To provide for the future prosperity of the Consolidated Company they have been obliged to secure control of the business of electric lighting.

Nearly all of the residences and apartment houses of the better class erected within the past year in Manhattan and the Bronx include provision for lighting by electricity and older houses are being fitted with the necessary fixtures.

The large profits in the electrical business will compensate for decreased profits on gas supplied at the low rate and allow the Consolidated to maintain its war upon the New Amsterdam Company until that corporation surrenders on the Rockefellers' terms. The Standard Oil people declare they will not pay a dollar for the New Amsterdam common stock, as it was given away, they assert, to the insiders at the time of the organization of the company.

The New Amsterdam people profess not to be worried by the recent move on the part of the Consolidated, [and President Jourdan pointed yesterday to the fact that by the charter of the East River Company, one of its constituent concerns, the New Amsterdam can go into the electric-lighting business if necessity should arise.

The financial details of the purchase of the Electric Lighting Company by the Consolidated are still withheld.

#### Are We to Lose Tesla?

COLORADO SPRINGS, Col., Jan. 6.—Nicola Tesla, who established an experimental station here in May last, will shortly return to New York City for a brief business visit. Mr. Tesla finds this climate conducive to his health, and

the 6,000 feet altitude proves to be all that can be desired for his work. It is understood here that he may remove his New York laboratory to Colorado Springs and permanently settle here.

#### LEGAL NOTES.

A settlement was recently effected in the case of the present owners of the Pittsburg and Birmingham Traction Company against H. Sellers McKee, Murray A. Verner, Pittsburg, and E. W. Clark & Co., Philadelphia, in which the plaintiffs sued to recover \$1,000,000 alleged to have been wrongfully spent by the defendants in changing the power of the Birmingham Company from horses to electricity. It was alleged in the bill that the defendants diverted a large sum to themselves. The terms of the settlement were not made known, but the demeanor of the plaintiffs and their attorneys indicated that they were well satisfied with them.

In a decision just handed down the Appellate Term of the Supreme Court of New York discussed the duty which conductors of street cars owed to the passengers on their cars. In the opinion of the court, written by Justice Leventritt and concurred in by Justices Freedman and MacLean, the court held that when a conductor had issued a transfer to a passenger he should be presumed to know that the passenger desired to alight at the place for which the transfer had been issued. "It might also be said," ruled the court, "that points for which transfers have been issued bear some resemblance to regular stations of steam railroad companies, where it is incumbent on them to stop long enough to allow passengers a reasonable time to alight, whether or not the conductor knows of any passenger desiring to leave the car." The decision of the court was made when it reversed a ruling of the Trial Term of the Supreme Court, dismissing a suit brought by Mary Schaefer, described by the court as a washerwoman, against the Central Crosstown Railroad, to recover damages for personal injuries. In reviewing the facts in the case, the court said that Mary Schaefer had not been guilty of contributory negligence because she alighted from the car without taking hold of the railings to guard against sudden movements of the car, nor because she had her washbasket in her hands, and said she was entitled to a new trial of her suit.

#### Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended January 6:

Amsterdam, 3 cases, \$85; Athens, 3 cases, \$26; British Australia, 5 packages, \$648; Canada, 8 cases, \$56; Florence, 24 packages, \$613; Hamburg, 95 packages, \$1,675: Havre, 104 packages, \$2,072; Hayti, 10 packages, \$60; Liverpool, 3 packages, \$1,200; London, 102 packages, \$4,449; 11 electrical machines, \$1,242; Rotterdam, 7 cases, \$75; Santo Domingo, 35 cases, \$3,544; Southampton, 4 cases, \$160; Stettin, 1 case, \$151; St. Petersburg, 1 case, \$154; Uruguay, 13 cases, \$150; U. S. Colombia, 16 cases, \$141.

#### Attractive Calendars.

We desire to acknowledge the receipt of an unusual number of attractive calendars for 1900. Two from the Okonite Company consist of large and handsome photographs of scenes in London. That received from the American Electri cal Works of Providence, R. I., is in keeping with the other

quaint and original souvenirs gotten up by this well-known oncern for state occasions. On the front and over the calendar is a handsomely engraved portrait of Benjamin Franklin, with a condenser and reel of wire on one side, and the famous kite and key on the other. On the back of the calendar the following inscription appears:

Among the best known of the early experiments in electricity are those of

Among the best known of the early experiments in electricity are those of BENJAMIN FRANKLIN.

that "many-sided genius," as he has been so aptly termed. As printer, publisher, patriot, statesman, diplomat, philosopher and philanthropist—whatever he did he did well, and his fame is world wide. His electrical experiments, particularly his kite flying, when he "wrested the lightning from the clouds," are inseparably connected with his name. These experiments, while they would be deemed crude in the light of the present day, were, in his time, most novel and evolved the fundamental principles upon which the later great discoveries in electricity were based. Therefore the use of his portrait in connection with the name of a company so long devoted to the manufacture of high-grade electrical wires and cables seems to us eminently appropriate.

American Electrical Works,

AMERICAN ELECTRICAL WORKS, Providence, R. I.

#### PERSONAL MENTION.

Mr. Herbert S. Wagner, formerly general superintendent of the Missouri-Edison Electric Company at St. Louis, is now president of the Mississippi Valley Automobile Fransportation Company, but will still remain consulting electrical engineer of the Missouri-Edison Electric Company. His successor as general superintendent is Mr. M. S. Holman.

Mr. Fred. A. Nash has been elected president of the Omaha (Neb.) Thomson-Houston Electric Light Company in place of the late Thomas L. Kimball.

Mr. L. F. Duggan of Wichita, Kan., has been appointed general inspector of the Missouri and Kansas Telephone Company, with headquarters at Kansas City.

Mr. F. E. Drake, Director of the United States Machinery and Electricity Departments of the Paris Exposition, sailed from New York January 4 on the Kaiser Wilhelm. Captain Mattox will go as soon as the final arrangements have been perfected on this side of the water.

Mr. Campbell W. Adams, formerly State Engineer, has been appointed by the Empire State Power Company of Amsterdam, N. Y., to succeed the late Mr. Dewitt A. Devindorf, who had charge of the work on the electrical plant at Schoharie Falls

Mr. E. H. Mather, formerly assistant general manager of the Connecticut Lighting & Power Company, has resigned to accept the position of treasurer of the Portland (Me.) Electric Light Company, where he will represent the Boston banking house of George A. Ronald & Co.

Mr. James Hamblet, who had been manager of the Western Union time service for twenty-five years, died on January 2 at his home, 20 Sydney place, Brooklyn, in his 75th year. He was also president of the Department of Electricity in the Brooklyn Institute of Arts and Sciences.

Mr. C. Loomis Allen recently resigned his position as general manager of the Rapid Transit Railway Company at Syracuse, N. Y., and is now general manager of the Lorain (Ohio) Street Railway Company.

#### INCORPORATIONS.

The Rockland Electric Company, Jersey City, N. J .- to furnish electricity. Capital stock, \$100,000. Incorporators: J. C. Young, F. B. Hyde and W. J. Wright, all of Jersey City.

The Oakland Electric Company, Waterville. Me.-to generate and apply electricity. Capital stock, \$10,000. Incorporators: W. S. Wyman, G. K. Boutelle and H. D. Eaton, all of Waterville.

The People's Light Company, Davenport, Ia.-to manufacture gas and electric light. Capital stock. \$250,000. Incorporators: A. W. Vander and J. S. Wylie, both of Daven-

The Lexington Gas & Electric Company, Lexington, Mass--to manufacture and sell gas, light, heat and fuel. Capital stock, \$40,000. Incorporators: E. I. Garfield, C. H. Miles and J. S. Miles.

The Niagara Falls Gas & Electric Light Company, Niagara Falls, N. Y. Capital stock, \$100,000. Directors: Harry Highland, Amasa A. Oatman, Elizabeth Read, Niagara Falls; Walter D. Ingham, Buffalo, and David W. McNair, New York

The Toledo, Tiffin & Sandusky Electric Railway Company, Port Clinton, O. Capital stock, \$3,000,000. Incorporators: R. W. Browne, George D. Loomis, J. M. Naylor, Frank C. Anderson, S. P. Calef, S. B. Sneath, Richard Young, J. F. Bunn, John McCauley, C. J. Yingling, B. W. Crobaugh and John C. Rover.

The European Railway Electric Lighting Company, New York City-to deal in apparatus for producing heat, light, power and gas. Capital stock, \$5,000,000. Stockholders: James G. Gregg, Frederick C. Rowly, Frank M. Wells, William E. Jackson and Alfred P. W. Seaman, all of New York.

#### ELECTRICAL PATENT RECORD.

This department is edited by OSCAR A. MICHEL. Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 305, 507 and 309 Broadway (Room 801), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR 4. MICHEL, Nos. 305 309 Broadway, New York City. N. Y., or 639 F street, N.W., Washington, D. C. Copies of any patent published can be furnished upon pay-

ment of ten cents. When ordering give name, date and title of invention wanted.

#### LETTERS PATENT ISSUED JANUARY 2, 1900.

#### ELECTRIC RAILWAYS AND APPLIANCES.

640,204. Trolley. Charles A. Jackson, Lewiston, Me., assignor of one-half to Fred A. Cram, Auburn, Me. Filed

signor of one-half to Fred A. Crain, Adburn, Me. Filed Feb. 16, 1899. 640,590. Trolley. Alfred N. Hauver, Fitchburg, Mass., as-signor of one half to Herbert E. Jennison, same place. Filed May 31, 1899.

#### ELECTRIC LIGHTS AND APPLIANCES.

ELECTRIC LIGHTS AND APPLIANCES.
640,362. Incandescent Lamp Holder. Leo Canda and Henry R. Bothwell. Cincinnati, O.; said Bothwell assignor to said Canda. Filed May 5, 1899.
640,363. Electric Incandescent Lamp. Francis M. F. Cazin, Hoboken, N. J. Filed March 21, 1899.
640,371. Reflector for Electric or Other Lights. John C. Fleming, Philadelphia, Pa. Filed March 2, 1899.
640,465. Incandescent Lamp. Elmer W. Gillmer, Warren, O. Filed March 4, 1886.
640,492. Shade-Holder for Incandescent Electric Lamps. Edgar A. Russell, Wallingford, Conn., Filed July 25, 1898.
640,493. Shade-Holder for Electric Lamps. Edgar A. Russell, Wallingford, Conn., and Harold Serrell, Plainfield, N. J., assignors to said Russell. Filed Oct. 28, 1898.
640,729. Electric Lamp. Willis A. Fenner, Providence, R. I. Filed May 15, 1899.

#### ELECTRICAL MACHINERY AND APPARATUS.

ELECTRICAL MACHINERY AND APPARATUS,
640,196. Electric-Meter Device. Caryl D. Haskins, Newton,
Mass., assignor to the General Electric Company of
New York. Filed Oct. 26, 1898.
640,344. Electric Transformer. James W. Packard and
Henry W. Wiswell, Warren, O. Filed June 23, 1898.
640,466. Rate-Indicator for Electric Currents. Jesse Harris,
Albany, N. Y. Filed Aug. 1, 1899.
640,688. Speed-Governor Attachment for Electrical Apparatus. James H. McGurty, Jersey City, N. J., assignor of
forty-nine one hundredths to Thomas McEwan, Jr., same
place. Filed April 7, 1899.

#### TELEPHONES AND TELEPHONE APPARATUS.

640,404. Telephone Central-Station Apparatus and Circuits, Samuel G. McMeen, Chicago, Ill., assignor to the American Bell Telephone Company, Boston, Mass, Filed July 31, 1899.

31, 1899.
413. Coin-Operated Public Telephone-Call Instrument, Frederick J. Clendennin, Hawksburn, and George A. P. Weymouth, South Melbourne, Victoria. Filed Jan. 20, 1808.

640.618. Telephone-Exchange System. Thomas F. Ahern, Detroit, Mich., assignor to the Detroit Switchboard & Telephone Construction Company, same place. Filed June 26, 1899.

#### MISCELLANEOUS.

Telephone Construction Company, same place, Filed June 26, 1899.

MISCELLANEOUS.

640,192. Electric Cloth-Cutter. Fulton Gardner, Chicago, Ill. Filed Jan. 13, 1898.
640,205. Milking Apparatus. Daniel Klein and William P. Swartz. Poughkeepsie, N. Y. Filed Dec. 19, 1898.
640,258. Electric Heater. Force Bain, Chicago, Ill., assignor to the George L. Thompson Manufacturing Company, Cook County, Ill. Filed Sept. 30, 1898.
640,273. Acoustic Alarm System. Clyde Coleman, Chicago, Ill., assignor, by mesue assignments, of two-thirds to the Bankers' Electric Protective Company, same place. Filed Sept. 3, 1897.
640,278. Multiple-Signal Transmitter. Leonard Dawson, Needham, Mass., assignor to the Gamewell Fire Alarm Telegraph Company, New York City. Filed May 5, 1899.
640,316. Coin-Controlled Electrical Apparatus. John Patterson, Chicago, Ill. Filed June 2, 1899.
640,316. Coin-Controlled Electrical Apparatus. John Patterson, Chicago, Ill. Filed June 2, 1899.
640,333. Electric Water-Filter. William L. Teter and John A. Heany, Philadelphia, Pa. Filed May 25, 1899.
640,363-640,364-640,365. Terminal for Electric Cables. William L. Candee, New York City. Filed Feb 16, 1899, Feb. 17, 1899. Renewed Nov. 10, 1899.
640,371. Electric Fuse or Cut-Cutt. Louis W. Downes, Providence, R. I. Filed April 12, 1890.
640,372. Gas-Engine Ignition Device. George W. Lewis, Philadelphia, Pa. Original applications filed Nov. 8, 1894, and Aug. 17, 1894. Renewed Sept. 22, 1898. Divided and this application filed June 21, 1895.
640,479. Connector for Battery-Electrodes, Fuses, etc. William Mills, Elizabeth, N. J., assignor to the Eastern Carbon Works, Rahway N. J. Filed March 16, 1899.
640,515. Art of Distributing Electrical Energy by Alternating Currents. Michael I. Pupin, New York City, Filed May 28, 1895. Renewed Oct. 14, 1896.
640,533. Cable-Terminal. William Callahan, Toledo, Ohio, Filed Oct. 4, 1899.
640,535. System of Electrical Distribution. Alberts, Hubbard, Belleville, N. J., assignor to the Goold Storage Battery Company, New York City, File



#### GENERAL NEWS.

What is Going On in the Electrical World.

#### ' LIGHTING.

Alliance, Neb.—This city is contemplating the erection of an electric lighting plant.

Atlanta, Ga.-The Georgia Electric Light Company is preparing to make extensive improvements to its plant. G. W. Brine is secretary.

Blue Rapids, Kan.-W. L. Hall is figuring on an electric light plant for this place.

Caldwell, Tex.—A company is being organized to build an electric light plant here.

Casey, Ill.—An electric light plant is to be erected

Cincinnati, O.—G. G. Luthy, representing the Royal Electric Company of Peoria, Ill., is endeavoring to in-terest the board of city affairs in an electric lighting proposition.

Cleveland, O.—The county commissioners are considering the matter of installing an electric light plant in the court house at an estimated cost of \$8,000.

Denver, Col.—The citizens are talking seriously of establishing a municipal electric light plant.

Dunbar, Pa.—An electric light plant is to be established here. Among the Philadelphia capitalists interested are William Drest, John N. M. Shimet, Hazot Dickson, Wm. M. Kitzmiller and James McMullen.

Eatherville, Is.—This city contemplates making several thousand dollars' worth of improvements on its electric light plant early in the spring.

Greenville, D. C.—This city contemplates the erection of an electric light plant to cost \$75,000.

Lake Odessa, Mich.—The matter of putting in an electric light plant is under discussion, by the council of this place.

Langdon, N. D.—This city is contemplating the nichase of an electric light plant now owned by indi-duals. To meet the demand for light it will be nec-sary to expend \$3,500 on improvements.

Lexington, Ga.-G. H. Smith of this city wants estimates on an electric light plant of 250 lights complete, except boiler and engine; also on three miles of copper line wire for same, together with 100 insulators, brackets, arms, etc.

ets, arms, etc.

Long Beach, Cal.—Plans have been adopted by the city for erecting a new electric light plant, and bonds to the sum of \$32,000 will be issued for that purpose, C. I. Goucher, city engineer, can be addressed.

Neligh, Neb.—This town is contemplating the erection of an electric light plant.

Nicholasville, Ky.—This city will construct an electric light plant. Address J. D. Young.

Paulaborough, N. J.—This village is contemplating the erection of an electric light plant.

Racine, Wis.—An ordinance was lately introduced at the council meeting in favor of granting to ex-Mayor Secor the right to build, maintain and operate an electric lighting plant in this city.

Vassalborough, Me.—The Mill Company intends erecting an electric light plant at Davis's dam for lighting the village of Vassalborough.

Washington, Ind.—The city council has decided to purchase an electric light plant.

West Haven, Conn.—The citizens of this place are agitating the question of a municipal electric light

Winchester, Ky.—The Martin Construction Company, owners of the electric light plant, will install a duplicate plant. A 370 horse power Corliss engine and two new dynamos will be put in.

#### STREET BAILWAYS.

Asheville, N. C.—I. B. Wilford of Bowling Green, Ky., backed by Chicago capitalists will in a few weeks begin the construction of an electric railway from this place to Weaverville, a town eight miles north of here.

Barre, Mass.—A plan is on foot to build an electric railway from Barre station to the Center, three and one-half miles, including sidings. The cost of the road is estimated to be \$80,000.

Brooklyn, N. Y.—The Brooklyn Bapid Transit Com-pany, will extend its lines about two miles from Jamaica avenue over the Fresh Pond road.

Baffalo, N. Y.—The Lockport-Olcott trolley line, an extension of the International Traction lines, will become a reality this year. General Manager Van Horn promises to begin work in the early spring.

Clarksville, Tenn.—E. L. Buckley of New Providence is promoting the proposed electric railway between this place and New Providence.

Clinton, N. Y.—There is quite some talk of building an electric road from here to Utica.

Columbus, O.—The Toledo & Western Railroad Com-Columbus, U.—The Toledo & Western Railroad Company is to construct and operate an electric road from Toledo through Lucas and Fulton counties, to a point of intersection of the old Indiana plank road and the boundary line between Ohio and Michigan.

Detroit, Mich.—The franchise for an electric line bytween Port Huron and Bay City has been sold at De-

troit, by W. Wheat, of Tuscola, to E. M. Hopkins of New York, N. S. Boynton and associates. The road is to be 110 miles long, and will touch Caro, Sanilac Cen-tre, Crosswell and Lexington.

Fort Wayne, Ind.—The Indiana & Ohio Traction Company which is to build an electric railway from Hicksville, O., to Marion, Ind., by way of this city, Huntington and Wabash, is now negotiating for the purchase of the line from Marion to Gas City.

purchase of the line from Marion to Gas City.

Hagerstown, Ind.—J. O. Barrett of the Indianapolis and Greenfield Electric Bailway Company says as zoon as the line is completed to Greenfield from Indianapolis the work of extending it will be commenced. Knightstown, 12 miles east of Greenfield, will be included, and a spur constructed south to the Soldiers' and Sailors' Orphans' Home. A branch line will be built to Newcastle, and thence east to this place and on into Richmond. It is stated that the road will eventually be built into Cincinnati. built into Cincinnati.

Hempstead, N. Y.—The Mineola, Hempstead & Free-port Traction Company, which wishes to build a trolley line from Mineola to Freeport, has received a franchise from the trustees of this village to construct and operate the proposed trolley line within the corporate limits of Hempstead village.

Kansas City, Mo.-R Gebtry and B. Corrigan have formed a company to construct an electric line in this city, which will be about ten miles in length. A franchise has been requested from the local authorities.

Lancaster, Pa.—An electric railway between this city and new Holland, a distance of fourteen miles, is prejected by the Conestoga Traction Company.

Projected by the Conestoga Traction Company.

Norristown, Pa.—The Doylestown Bailway Company has filed plans for an extension of its road, by which there will be a continuous line from Easton to Philadelphia passing through Hatboro, Hartaville, Hillside, Athington, Genside and Weldon. W. Jenks Fell is president, and W. C. Byan secretary of the company.

Philadelphia, Pa.—Estimates are soon to be taken on construction materials and other work for the construction of a trolley line, and necessary power house and other buildings, which will be erected by the Lower Marion & Conshohocken Railroad Company. It is to start in West Philadelphia.

Rochdale, Mass.—This town hopes soon to be connected with Worcester by a direct electric line. The project is favorable, and there will be no trouble in getting the necessary franchise.

Siloam Springs, Ark.—The city council has granted a franchise to Col. E P. Watson to build and operate a street railway in this city.

Springfield, O.—Howard Bateman, I. E. Ballard and P. B. Chesseldine are talking of building an electric railroad from South Charleston to this city

Stevens Point, Wis.—The newly organized Wisconsin River Valley Advancement Association is pushing a plan to build an electric road between this place and Tomahawk.

Tacoma, Wash.—The preliminary arrangements have been completed for the building of an electric railroad from Fairfax to the Carbon river mining district, a distance of nine miles. The cost is estimated at \$100,000. Work will be begun in the spring.

Wabash, Ind.—The county commissioners granted to Judge H. B. Shively, W. G. Sayre and H. C. Pettit a franchise permitting the construction of an electric railroad from the north line of the county to this city.

Windsor Locks, Conn.—George H. Dunham of New York, owner of the charter of the Springfield & Southwestern Street Railway and the Suffield & Windsor Tramway Company, says that the two roads will certainly be built next spring, that is the line between Rainbow and the State line.

#### MANUFACTURING, ETC.

Boston, Mass.—The Edison Electric Light Company Boston, Mass.—The Edison Electric Light Company lately closed a contract with Norcross Brothers for the erection of a new brick building adjoining the shops at No. 516 Atlautic avenue. The new building will contain an engine room 80 x 145 feet, in which will be installed a 50-ton crane and an engine of 3,000 horse power, with the dynamos to accompany it. It is likely that another new engine will be added the coming

year.

New York.—A large shipment of material and equipment for the Sao Paulo Electric Light & Power Company was forwarded by the Lambert & Holt steamship Buffon, which sailed for Brazilian ports January 5. The cargo consisted of 400 tons, including a 100-ton lot of piping, which is part of the \$120,000 contract recently placed with the Riter Conley Manufacturing Company of Pittsburg. The rest of the cargo was made up of engines, steam valves, steam water pipes, electrical apparatus and a miscellaneous lot of engineers' fittings and general supplies. apparatus and a misce and general supplies.

Philadelphia, Pa.—The British steamship Ping Suey left this port last week for Rotterdam, carrying a thousand tons of steel trolley rails, each forty-five feet long and weighing 1,300 pounds. The rails are to be used in equipping an electric railroad to be built in Holland on the American plan.

### MINES, ETC.

Redding, Cal.—A company composed of Eastern and San Francisco capitalists proposes to erect a large power plant on the bank of a stream in Shasta County. En-

gineer C. W. Waller states that the number of large mines now being developed and many others rapidly approaching the point where power is essential, the plant should prove a profitable investment. Electricity may be conducted to this and other places for lighting purposes, but first attention will be given to supplying ver to the mines.

#### COMPANY MATTERS.

Camden, N. J.—Plans are being prepared for the erection of a new electric power house to be built here by the Camden & Suburban Railway Company to cost \$15.000.

Concord, N. H.—The Lisbon Electric Light Company and the Lisbon Power Company have been consolidated and a new company organized with a capital stock of \$30,000.

Findlay, O—The Hancock Electric Light & Power Company and the Findlay Street Bailway Company have consolidated, the latter purchasing the other plant for (49,000.

Colorado Springs, Col.—The Colorado Springs Rapid Transit Company will spend \$200,000 this year. A large part of this money will be expended in the construc-tion of additional lines, while the remainder will be employed in the purchase of machinery and equip-

Denver, Col.—The Woods Investment Company of Victor has purchased the Gillette Light & Power Company's plant of this city. The new owners will abandon the generating plant next July and supply light and power on the existing wires from the big plant they are now constructing at the head of Beaver creek, nice miles ways. The current will be carried to Cempany and the contract of t nine miles away. The current will be carried to Cameron and Gillett, thence to Victor and Cripple Creek, where power will be supplied to the intervening towns and mines in the vicinity.

Greensburg, Pa —The car barns and rolling stock of the Greensburg, Jeannette & Pittsburg Electric Rail-way were recently destroyed by fire. The loss is about

Greenville, S. C.—A new power house for the Greenville Electric Street Railway will be built in the near

Holly Reach, N. J.—The Seacoast Electric Light & Holly Beach, N. J.—The Seascoast Electric Light & Power Company has sold their plant to a new company composed principally of Philadelphians. They will improve the old plant and in all probability construct a trolley road along Five Mile Beach, connecting the resorts of Anglesea, Wildwood and Holly Beach.

McKee's Rocks, Pa.—The syndicate which has recently purchased the McKee's Rocks plant, proposes to enlarge the capacity of the plant, so it will be able to supply light to Ingram and Idlewood. The Carnegie plant will be converted into a transformer station.

New Haven, Conn.—The New Haven Railroad Company will soon commence the construction of a large storage battery plant at Bristol, Conn., in connection with the New Britain third-rail system.

New York.—The plant of the United States Electric Light Company in East 24th street was recently damaged by fire.

Salt Lake City, Utah.—The Union Light & Power Company was recently absorbed by the Utah Light & Power Company, which succeeds to all of its property, interests and business.

Sherman, Tex —The Interurban Railway Company, f which J. P. Withers is president, will erect a large central power house.

Washington, D. C.—The machinery in the power house of the Potomac Electric Light & Power Company's works was recently wrecked by fire. The loss is estimated at \$50,000.

#### POWER AND TRANSMISSION PLANTS.

San Pedro, Cal.—It is reported that a large electrical plant may soon be erected here to supply power to the farmers for pumping water and other purposes.

Worcester, Mass.—The Worcester & Suburban Street Railway Company is to concentrate all its power plants, carhouses, machine and repair shops in this city. The power station will have a 2,000 horse power unit in connection with the storage batteries, which will be sufficient to furnish power for both the Spencer and Millbury divisions of the road.

#### AUTOMOBILES.

Chicago, Ill.—It is reported that Illinois men propose Calcago, 11.—It is reported that Illinois men propose to establish an automobile school, livery and cab service. The cab service plan is to contract with people by the year to take them to and from their (flices. The scheme is to be tried on Euclid avenue, and if successful will be extended to all parts of the city. It is said the company will have 100 autos in operation in the city in a shirt time if present plans are carried out.

New York.—The first auto ambulance in this country was donated by Edward Kelly to the St. Vincent's Hospital. It is operated by an electric motor supplied with power from a storage battery and cost \$3,000.—
Last week the automobile stage made its first appearance on Fifth avenue. The trial trip was satisfactory.

Miss Florence E Woods is the first woman to receive a permit from President Clausen of the Park Board, to ance on a permit from President Clausen of the operate an automobile in Central Park.



## THE TELEPHONE WORLD.

#### Active Warfare Soon to Begin.

Active warfare in New York City between the New York Telephone Company and the Telephone, Telegraph & Cable Company of America will begin in earnest within a few days, when the latter organization, through the Knickerbocker Telephone Company, its local corporation, will begin a general canvass for contracts at rates that will be about half of what the Bell Company is now charging.

what the Bell Company is now charging.

It is not likely that the Knickerbocker Company's system will be in operation for another twelve months, but every effort will be made to obtain contracts that will make the concern at once a formidable rival to the Bell. At the prices scheduled by the Knickerbocker Telephone Company, business houses will be charged \$120 and residences \$60 per year for unlimited service in the boroughs of Manhattan, Brooklyn and the Bronx, with toll charges to points outside of those districts. In Queens and Richmond the rate will be \$48 for business houses and \$36 for residences, with the option of taking service on the same basis as that offered in Manhattan, the Bronx and Brooklyn, if desired, and with tolls of about six or eight cents a message. In each case the subscribers will be connected by metallic circuit, with exclusive use of the circuit, which will give them a private and not a party line.

#### An Independent Movement.

A committee representing the independent telephone interests of Indiana, Ohio, Michigan and Pennsylvania, met in Cleveland, O., a week ago and perfected a working combination between the independent companies in the States mentioned. It is understood that each company will maintain its individuality. A clearing house will be established, similar to that of the banks, through which the various companies will do their business and balancing of accounts with one another

After the committee adjourned it issued a statement, the burden of which follows:

"Up to the present the independent telephone companies have been interchanging business within their respective States under such arrangements as seemed to meet the requirements of local business, but the volume of business has grown to such proportions, and the interchange of service between the various States has become so great that it is deemed necessary that there be a consolidation for the purpose of interchange of business between the various States interested under some general rules and regulations relative to rates and methods of handling the business as well as the construction and equipment of lines.

"Through the work of this committee the independent telephone companies of these States have effected such a combination for working purposes and interchange of business as will insure to the public every facility and as good service for local and long distance purposes as is possible to be rendered by any company or combination of interests. This committee will fix a basis for rates that will be uniform throughout the territory covered by the combination."

Meetings are being held in this city from day to day for the purpose of effecting a consolidation of the various manufacturers of telephone apparatus, which are now being operated in opposition to the Bell Telephone Company. The capital involved in the new combination, which will be known as the American Telephone Manufacturing Company, will be about \$10,000,000. The scheme is only incidental to the larger one of independent telephone service. There are at present throughout the country between 400,000 and 500,000 instru-There are at present ments operated independently of the Bell concern, and it is the manufacturers of these who will be united in the new company. One of the men interested in the deal is reported as saying that, while the combination was viewed favorably by the companies entering into it, the arrangement of details would still take some time. The new corporation will, it is said, absorb the following companies: Phoenix Telephone Company, Schmidt & Bruckner Electric Company and De Veau, of New York; Couch & Seely, of Boston, and Stromberg-Carlson Telephone Manufacturing Company, Sterling Electric Company, Victor Telephone Company, American Electric Company, Western Telephone Construction Company and Eureka Telephone Company, all of Chicago.

It is announced that Mr. James E. Keelyn has been obliged to resign the presidency of the Western Telephone Construction Company of Chicago owing to ill health, Mr. Keelyn organized this well-known independent telephone manufacturing concern in 1893, and it was principally through his efforts that the company now holds the envious position that it does.

A Minneapolis paper says: "The day of cheap telephones in Sioux City is over. The home company has been swallowed by the Iowa Telephone Company, a Bell concern, and rates will be pushed up at once. All the toll lines of the home company in the surrounding States are included in the deal. The price paid has been withheld."

#### Telephone Wires for Telegraphing.

The fact that long distance telephone lines are used simultaneously during a great portion of the time for both tele phoning and telegraphing without the slightest interruption or trouble to either system is probably realized by but very few people, even among those who patronize the long distance telephone most freely, says the N. Y. Herald.

Nevertheless, such an arrangement has been in successful operation for a considerable length of time, in connection with the long distance service.

To illustrate the value of the scheme, it may be said that a wire between New York and Chicago is leased to a brokerage firm for telegraphing. The same circuit is used by the telephone company for connecting parties between the same cities who desire to converse by long distance 'phones. As previously stated, there is not the slightest interference with either the telegraph or telephone arrangement, although both may be in use at the same moment. Even an expert cannot tell when the line is "doubled up."

For long distance telephoning two wires are always used, forming a metallic circuit. This is done to avoid the ground currents and ofttimes troublesome induction from electric light and trolley wires when the earth is used.

The "doubling up" plan can be utilized on any metallic

The "doubling up" plan can be utilized on any metallic circuit at practically no expense. The only thing required is a condenser. The latter acts as a sort of electrical accumulator. After an electrical current has passed through the tinfoll strips they retain a certain amount of electricity, which steadily oozes from one strip to another. The current thus induced is sufficient to transmit the human voice.

From each side of the telegraphic key, as used in connection with a telephone circuit, a wire is run to the condenser, which forms what may be termed a telephone "bridge."

While the key really opens and closes the main line circuit the voice of a person using the telephone travels by way of the "bridge," or condenser, at periods when the line is open at the telegraph key. In other words, by means of the induced current and condenser the voice goes around the telegraph key, which is transmitting Morse signals by breaking and closing the circuit on the main line.

This simple arrangement, which costs only a few dollars to install, makes it possible to double the earning capacity of long distance telephone wires.

Each telegraphic circuit between, say, New York and Chicago, when leased to brokers or newspapers, brings the company owning it a revenue of about \$15,000 per year. The same circuit will probably each earn double that amount in telephone tolls during the same period.

Fariners in the western part of Wood County, Michigan, have a rural telephone service in operation. The farmhouses between Grand Rapids, Weston and McClure are connected by 'phone with these towns, and the farmers enjoy the same privileges accorded town patrons of the line. No toll fees are charged to the farmers for communicating with any person in the district covered by the system, including the exchanges in the three towns. The telephone company, which is composed of business men at Grand Rapids and Weston, proposes to put a 'phone in nearly every house in the section of the county lying between these three points. The innovation promises to extend all over the county. Farmers will be thus placed in immediate communication with several markets, and if they have anything to sell they can first learn the prices offered by various dealers and then deliver to the one offering the best figure.

The Eastern Shore Telephone & Telegraph Company, referred to in last week's issue of Electricity as having been incorporated with headquarters at Denton, Md., has elected the following officers: President, H. A. Richardson, Dover; vice-president, T. L. Day, Ridgely; treasurer, Du Pont Walker, Dover; secretary, F. R. Owens, Denton. The directors are W. H. Baker, W. R. Martin, George W. Woodford, George M. Price, Jr., and Wilbur W. Hubbard. The company controls the Union Telephone Company, of which Mr. Day is president, the Cecil county telephone lines and 27 miles of telephone lines in Dorchester county. Mr. Richardson, the president of the new concern, is also president of the Diamond State Telephone Company. The new company is limited to a term of 40 years. Its capital stock, as stated last week, is \$100,000.

The Whitney syndicate which recently purchased all of the independent telephone companies in Westchester County, N. Y., is now engaged in connecting the lines in the various cities and towns. Wires are being strung between New Rochelle and Mamaroneck along the tracks of the New York, New Haven and Hartford Railroad.

The Police Board of Poughkeepsie, N. Y., has adopted a telephone call system. When the system is completed there will be twenty-four telephones scattered throughout that city all connecting with police headquarters.

#### Signs for Toll-Line Stations.

The American Electric Telephone Company, Chicago, is sending out several thousand of its very appropriately designed toll-station signs. The illustration shows a standard



design. The lettering is, of course, susceptible of adaptation to the requirements of each individual company, while the sign itself is handsome and attractive.

#### General Reduction of Rates

The new schedule of long-distance call rates for Springfield, Mass., which was announced some time ago by the New England Telephone Company, went into effect at midnight on December 31. There is a general reduction of longdistance rates of about 30 per cent. Along with it, however, says the Springfield Republican, goes a reduction of the time limit, which may cause some doubt as to the value of the concessions which the schedule embodies. A careful comparson of the new rates with the old show that those who use the telephones for long conversations are sufferers by the socalled concessions. Up to seven minutes the new rates are lower than the old, while above that the new rates make tele-phoning much more expensive than before. This difference in favor of the old rate increases with the length of conversation. This result comes from the reduction of the minimum time limit, which is now three minutes, whereas it was five under the old schedule. Under the new schedule a subwhich to close his conversation after notice by the operator, while under the old schedule he was allowed 80 seconds.

General Greely, of the Signal Corps, has just shipped to and Francisco \$50,000 worth of material to be used in establishing the army telephone and telegraph lines in the Philippines. The material will be sent on the first transports that sail, which will be early in this month. The shipment will consist of miles of wire, telegraph and telephone instruments, batteries and other things which go to make up a complete equipment for telegraph and telephone stations. The material will reach Manila early in March, and Col. James Allen, who is in charge of the Signal Corps in the Philippines, will proceed to perfect a system of communication.

The Bell Telephone Company will, it is said, build a new line of wires through Webster Groves and Kirkwood, Mo., as soon as the franchises can be obtained, and will inaugurate a telephone system in the suburban towns with Webster as the central station. It is rumored that the Kinloch Company will extend its service through this district within the next month.

The directors of the Rensselaer Telephone & Telegraph Company, which was incorporated at Albany, N. Y., on the 30th ult.. are: John H. Gleason, Edward F. Murray, John J. Smith, E. E. Summy and Charles Mahoney of Troy, N. Y.

#### TELEPHONE INCORPORATION.

The Telephone, Telegraph & Cable Company of Eastern New York. To operate in Suffolk, Nassau, Queens, Kings, Westchester, Putnam, Dutchess, Columbia, Rensselaer, Saratoga, Washington, Warren, Essex. Clinton, Franklin, Schenectady, Albany, Greene, Ulster, Orange, Rockland, Richmond and New York counties. Capital stock, \$10,000, Incorporators: William H. Eckert, Walter W. Perkins, Arthur Phillips, William S. Eckert and Frank B. Hall, of New York City, and George W. Synder and John D. Stauffer, of Philadelphia.



## **ECTRICA** SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

## STOCKS.

PASSENGER RAILWAYS.							PASSENGER RAILWAYS.						
KAND.	Par	Capital		Bate and Date of Last Div.	Bid. Asked		NAME.	Par	Capital		Bate and Date of Last Div.	Bid.	Anke <b>4</b>
Albany, N Y Jan 8  Albany By. Co	100	2,000,000 2,000,000	\$1,750,000 2,000,000	1½ % Q., Nov. '98. 1 % Q., Sept , 98.	180	190	Hartford Conn Jan 8 Hartford Street Ry. Oo Hartford & West Hartford RB		\$4,000,006 1,000,000	\$200,000 247,000	3 % 8., Oct., '98	.5	
Traction Co. (Saratoga)	100	50,000	50,000		••		Holyoke Mass.—Jan 8 Holyoke Street By. Co	100	400,000	400,000	8 % A., June, '98.	260	475
Allentown PaJan 8: Allentown & Lehigh Val. Trac. Co		4,000,000	1,500,000	• • • • •		15	Hoboken, N. J.—Jan 8 North Hudson Oo. (N. J.) Ry. Oo.	. 25	1,250,000	1,000,000	8 %, 1892	·F0	
Bridgeport, Conn—Jan 8: Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug., '98.			Indianapolis, Ind-Jan 8.		5,000,000	5,000,000		28	81
Baltimore, Md.—Jan 8 a United Railways & Elec. Cocom		, ,			161/5		Lancaster, PaJan 8 Pennsylvania Traction Co		10,000,000	9,900,000	***************************************		
Boston, MassJan 8		5,000,000		1 % Q., Jan.15, '97			Lancaster & Col. Electric Ry West End Street Railway	<u>,</u> ]		87,500	1		-
New England Street By	100 100 50 50	4,000,000 2,000,000 10,000,000	4,000,000 2,000,000 9,085,000 6,400,000		15 85	16 87 531/4 117 >>	Louisville, Ky.—Jan 8: Louisville Rycom Louisville Ry	100 100		8,500,000 2,500,000	1% %., April '98. 2% % S., Oct. 1, '98	İ	1111
Brooklyn N.:Y.—Jan 8 Brooklyn City & Newtown By			1,928,400		800		Twin City Rapid Transitcom Twin City Bapid Transit? % ptd		17,000,000 8,000,600	15,010.000 1,712,200	1¾ %, Oct., '98.	136	137
Brooklyn Rap. Transit Co., ir cerif.  cBrooklyn Heights Railroad  dBrooklyn City RRgus.	100	20,000,000 200,000 12,000,000	20,000,000 200,000 12,000,000	8 <b>½ % Q.</b> , Jan., '99		737/8 109 241	Montreal, Canada. – Jun 8: Montreal Street Ry. Co Toronto Street Ry. Co				3 % 8., <b>M. &amp; N.</b> 1% % 8., J. & J.		813 1069
eBrooklyn, Queens Co. & Sub. RR Coney Island & Brooklyn RR Kings County Elevated		4.750.000	)  <b>4.750.00</b> 0	2 1/2 % Nov., '98. 1 % July 26, '97	845		Memphis TennJan 8; Memphis Street Railway Co	. 100	500,000	500,000	***************************************	2	
Kings County Traction Copfd Nassau Electric Railroadpfd (Atlantic Avenue Railroad gBrooklyn, B. & W. E. Railroad	50	6,000,000	6,000,000 2,000,000	•••••	76	77	New Haven, Conn.—Jan 8 Fair Haven & Westville RR New Haven Street Railway Co New Haven & Centerville	1 100	1,250,000	2,000,000 1,000,000 800,000	3 % S., Sept. '98. 21/2 % A., July '96.	46 	
Buffalo, N. Y.—Jan 8: Buffalo & Niagara Falls Elec. By Buffalo Railway Co	100 100			1 % Q. Dec., '98.	74 100	75 102	New Orleans, LaJan 8:	. 25		600,000	••••••	47	-
Columbus O.—Jan 8 Columbus Street Railroad Columbus Contral Street Railroad	100	8,000,000	8,000,000	1 % Q., Feb., '99.	20	22	New Orleans & Carrollton RR New Orleans Traction Co new com	100	1,200,000	•••••		1485 295 101	
Charleston, S. C.—Jan 8 Charleston City Ry. Co Interprise City RR. Co	50 25	100,000		8 % S.	-:	::	aCrescent City RR. guar bNew Or. Oity & Lake RR. guar Orleans Railroad. St. Charles Street Railway	100	2,000,000 2,000,000 500,000	2,000,000 2,000,000 185,000 1,000,000	3 % 8., Jan., '99. 1 % 8., Jan., '99. 1 ½ %., June, '94. 1 ¼ %. Oct., '98.	565	52
Chicago, Ill.—Jan 8 Chicago City Ry. Co	. 100 . 100 . 100 . 100 . 100 . 100	10,323,80 10,000,00 15,000,00 15,000,00 10,000,00 500,00 2,000,00 20,000,00	0 10,823,800 10,000,000 0 15,600,000 0 2,500,000 0 6,600,000 0 249,90 0 1,608,20 0 18,189,00 0 624,90	8 % Q., Jan., 99.	173 8 236	283 18 81 > 237  11734 85	New Yopk—Jan 8 Cantral Orosstown RR. Cchristopher & 10th Sts. RR. guai Dry Dock, E. Brdw'y & Battery RF, dMetropolitan Street Ry. Co. eBleecker St. & Fulton Fy. Ry. gua fBroadway & Seventh Ave. gua gOen-Park, N. & E. Rivers RR. gua hEighth Avenue RR. i42d St. & Grand St. Ferry RR. gua jNinth Avenue RR. eSixth Avenue RR. ETwenty. third St. R. B. R. Rus hEighth Avenue RR.	100 r. 100 k. 100 100 r. 100 r. 100 fr. 100 fr. 100 fr. 100	1,800,000 1,000,000 750,000 800,000 2,000,000	600,000 650,000 1,200,000 80,000,000 900,000 1,800,000 1,000,000 748,000 800,000 2,000,000	02½ % Q. 02½ % Q., Oct., '98. 01½ % Q., Nov., 98. 01½ % Q., Jan., '99. 02½ % Q. 02½ % Q. 01.	269 168 125 175 35 280 115 400 160 100 895	270 174 180 17. 40 281  4 0 42 1: 5 2 1
Cincinnati, Ohio.—Jan 8: Cincinnati Inc. Plane Bycon Cincinnati Inc. Plane Rypfc Cincinnati, Newport & Cov. St. Ry Concinnati Street Ry. Co	1. 50	1,000,00 150,00 4,000,00	6 575,00 0 150,00 0 8,500,00	)	33	89	Second Avenue RR. Third Avenue RR. m426 St. Manhatv'le & St. Nich. A *Union (Huckleberry) Ry. Newark N JJan S;	100	2,500,000 12,000,000 2,500,000	1,862,000 10,000,000 2,500,000	0 2 % Q., Jan,, '99. 0 \$1.75 p. sh. Feb. 99 0	1.47 18.75 190	181 c2 200
Mt. Adams & Eden Park Inc. Ry Cleveland, Ohio,—Jan 8 Arron, Bed. & Olev. Elec. By Cleveland Clty Ry Cleveland Electric By	100	1,000,00	0 1,000,00 0 7,500,00	0 1 1	48	50 101 92	Consolidated Traction Co. of N. J North Jersey Street Railway Co. United Electric Co. of New Jerse Pittsburg, Pa. – Jan 8; Allegheny Praction Co.	y 100 100	504,000	6,000,000 504,000		64 18 80	66 34 81
Detroit, Mich.—Jan 8 Detroit Citizens' Street By Ft. Wayne & Belle Isle By Rapid Ballway Co Detroit Electric Hallway Wyandotte & Detroit River By	100 100	2,000,00 0 250,00 1,000,00	1,250,00 1,200,00 0 250,00 1,000,00	0	1001 175 90		OUOnsolidated Traction Cocom Consolidated Traction Copfc pCentral Traction CogOitizens' Traction Cogoitizens' Traction CosPittsburg Traction CosPittsburg Traction Co.	50 1. 50 50 50 50 50	15,000,000 15,000,000 1,500,000 8,000,000 1,500,000 1,400,000	15,000,000 15,000,000 [900,000 18,000,000 1,900,000 1,400,000	0 2 %, Jan., '95. 0 3 %, Nov. '98. 0 1 % % Nov. 7, '98. 0 6 % A. 0 8 %, Nov. 7, '98. 0 2 %, July, '98.	25 61 69	26 62 70 28
Dayton O.—Jan 8: Oity Railway Cocon Oity Railway Copfc People's Street Railwaypfc	a. 10	0 1,500,00	1,470,60 600,00	0 1% % Q.	126 <sup>1</sup> 160 114	% 1i5	Pgh., Allegheny & Man. Trac. Co. Pittsourg & Birmingham Trac. Ry Pittsburg & West End Ry. United Traction Co	50 7 22 50 50	8,000,000 8,000,000	0   12,994,839 0   8,000,000 0   1,500,000 0   17,000 000	912 %, Aug., '95, 01 %, Oct. '98, 05 % A., June 80, 9 J. & J.	48	48 <sup>1</sup>

\*Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by the secompanies, and also the Central Railway Co of Baltimore. The pref stock of U R & Ec Co ha-been issued in the form of income bonds.

b Leased to Beston E evated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Rapid Transit Company.

d Leased to Brooklyn Rapid Transit Company; road operated by Brooklyn Rapid Transit Company; road operated by Brooklyn Rapid Transit Company; road leased to Nassau E ectric RR.

g Owned by Atlantic Ave RR and leased to Nassau system.

h \$30 per share on outstanding capital pard as rental by lessee—West Chicago St. RR. Co.;

250 100 of stock owned by North Chicago Street Railroad Company.

i Controls by lesse Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tonnel Company.

j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; 5% on \$1,000,000 stock guaranted by West Chicago Street Railroad Company; \$% on \$1,000,000 stock guaranted by West Chicago Street Railroad Company; \$% on \$1,000,000 stock guaranted by West Chicago Street Railway Company; lessee.

Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

\*\*Unlisted. † Full paid. [Outstanding. ‡ Ex-div.
a Leased to New Orleans Traction Company at 6 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock and interest on bonds.
c Leas d to Central Crosstown Railroad at 8 % on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
e Leased to 23 f Street Ry for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway.
g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
h Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
h Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
h Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter,
k Leased to Metropolitan Street Railway for 18 % on took
j Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railread by purchase.
n Dividends of 1% yearly guaranteed by Consolidated Traction Company.
o Controlled by Third Avenue Railread by necessary.
Dividends of 184 % yearly guaranteed by Consolidated Traction Company for 8 % per annum on par value of stock
q Leased to Consolidated Traction Company for 6 % on \$3,000,000 capital stock.
r Leased to Consolidated Traction Company for 6 % on capital stock.
s Leased to Consolidated Traction Company for 7 % on capital stock.

#### TELEPHONE AND TELEGRAPH COS. PASSENGER RAILWAYS. Capital Stock. Capital Stock. Bare and Date of Last Div. Bate and Date of Last Div. NAME. Par Authora'd! Issued. Eld. Asked. 医水面皮 Par Authors'd| Issued. New Bedford Mass-Jan 8 Boston, Mass.-Jan 8. 50,000,000 28,650,000 42, % Q., Jan., '99. 885 1.54 Q., Feb. 20, '99. 189 1.50 p. sh. Feb '99. 189 100 \$850,000 \$350,000 2 %, Feb. 98. 160 165 American Bell Telephone Co...-Erie Telegraph & Telephone Co... New England Telephone Co..... Union Street Railway Co. 00 14,000,000 14,000,000 13, % Q. 00 10,000,000 10,000,000 13, % Q. 01 10,000,000 10,000,000 13, % Q. 01 10,000,000 10,000,000 13, % Q. 02 10,000,000 13, % Q. 03 5,000,000 13, % Q. 04,800,000 13, % Q. 05,000,000 13, % Q. 05,000,000 15,000,000 13, % Q. Northampton, Mass-Jan 8 Northampton Street Rv ..... 100 800,000 225,000 4 % A., June '98. 170 178 New York.-Jan 8 New York.—Jan 8 American Telegraph & Cable Co... \*Central & South Am. Teleg. Co... \*Commercial Oable Oo... Franklin Teleg. Co... 2% & guar. Erle Telegraph & Telephone Co... \*Cold & Stock Telg. Co.. guar. 6 %. \*International Ocean Tel Co. guar6% Mexican Telephone Oo... \*New York & New Jersey Tel. Co... \*Pacific & Atlantic Teleg. guar. 4 % \*Postal Telegraph Cable Co... \*Sout'n & Atlantic Telg. Co. guar. 5% \*Commercial Union Telegraph Co... Western Union Telegraph Co... \*Signal Postal Teleg. Co... Omaha, Neb.-Jan 8. 100 5,000,000 5,000,000 8 % A. and N. 55 Paterson, N. J.-Jan 8 112 100 1.250,000 1,250,000 119 117 Providence, R. L.-Jan 8 105 106% United Traction & Electric Co 100 8,000,000 8,000,000 1/4 %, Oct. '98 2,000,000 1,770,000 2 %, Dec. '97. 1,968,100 11,965,100 2 % %, July 15, '98. 588,900 800,000 80,000,000 20,98 % 5—July, '98. 800,000 8 % Feb. 1, '98. 8297,920 500,000 11,875,000 \$14 sha'e A—Apr.98 Philadelphia.-Jan 8. 48 76 1.6 4.1/4 120 87 Miscellaneous.-Jan 8: 451 400,000 8,960,000 1,000,000 | 1,000,000 | 1,000,000 | 1,000,000 | 1,000,000 | 1,000,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,700,000 | 2,77,402 | 30,000,000 | 1,700,000 | 2,700,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500, 84 8,561,000 2 % 8. 188 96 200 148 78 114 115 90 90% \$7 210 150 80 115 750,000 750,000 145 152 2,000,000 2,500,000 2,000,000 1 % Q. 2,500,000 23/4 % Q. 961/4 8,000,000 157 ELECTRIC LIGHT AND ELECTRICAL MFG. COS. 600,000 475,000 | \$7.50 share July '98 | 202 298,650 | \$8.50 share July '98 | 100 420,000 | \$12 share July '98 | 3.8½ 200,000 | \$2 share July '98 | 3.8½ 250,000 | \$2 % S. July '98 | 3.8½ 383,000 | \$1 sh A. July '98 | 3.9 900,000 | \$9.50 shre July '98 | 239 | \$750,000 | \$10 share July '98 | 255 1,000,000 1,000,000 750,000 203 Boston, Mass.—Jan 8: . . . . . . . 25 100 40,000,000 80,460,000 2 % Q., Aug., 1808. 100 18,276,000 18,276,000 1 % % Q., May '99. 1,000,000 1,500,000 750,000 117 118 240 8% 45 61% 146,700 8,996,058 8,195,126 50 50 50 46 4 000 000 8 15/4 % Q., Jan., '99. Rochester, N. Y.- Jan 8: ochester Railway Co..... 100 5.000,000 5,000,000 18 Reading Pa.-Jan 8 119 120 9,188,000 4,000,000 2,000,000 13 % Oct., '98. 1,000,000 Semi-an.,Jan. & Jy 1,000,000 12 91 100 50 50 850,000 850,000 Jan., '98. 1,000,000 11,000,000 Jan., '98. 100 40,000,000 80,460,000 2 % Q... Aug., 1898. 100 18,276,000 18,276,000 1½ % Q.. May '99. 1,000,000 2,500,000 2,500,0 00 A. & O. 1221/4 St. Louis Mo.-Jan 8 St. Louis Mo.—Jan 8 Fourth Street & Areenal Ry Jefferson Avenue Ry. Co... Lindell Ry. National Railway Co... Cass Avenue & Fair Grounds... Olitizens' RR... St. Louis RR... Missouri RR. reople's RR. Co... Fouthern Electric Ry... St. Louis & Suburban Ry. Union Depot RR. 150,000 400,000 2 % Dec., 1888. 2,409,000 1½ % Jan., '99. 2,500,000 1½ % Jan., '99. 2,000,000 1½ % Jan., '99. 2,000,000 1½ % Jan., '99. 2,000,000 1½ % Jan., '99. 800,000 50c., Dec., '89. 500,000 1,000 3 %, Jan., '99. 2,500,000 ... 4 ( 110 50 50 100 800,000 400,000 2,500,000 2,500,000 2,500,000 2,000,000 2,000,000 1,000,000 1,000,000 1,000,000 4,000,000 135 Pittsburg, Pa.-Jan 8 Allegheny County Light Co...... East End Electric Light Co..... 172 Philadelphia, Pa.-Jan 8: \*Electric Storage Battery Co...com. \*Electric Storage Battery Co...pfd. Northern Elec. Light & Power Co... Southern Elec. Light & Power Co... 100 100 100 2,000,000 8,500,000 5,000,000 1201/8 120 120 116 100 76 18 80 4,000,000 8 % A., July, '95. 100 Miscellaneous.-Jan 8: San Francisco, Cal.-Jan. 47 25 18% 128 6 195 95 1184 108 500,000 28 15 182 8 600,000 50c, monthly, 875,000 82.50 share, '96, 18,750,000 Q., 60c, per share. 1,000,000 1,000,000 ..... . . . . $\frac{60}{62}$ 850,000 175,000 100,000 1,200,000 18,750,000 1,000,000 550,000 .... Scranton, Pa -Jan 8 2 % Q., Oct., '98. 100 6,000,000 500,000 1,050,000 2,500,000 500,000 1,050,000 163 195 18834 10) 106 1,000,000 1,085,000 2% Q 0 13% % Q 8 % S, Dec. 1, 96. ..... 1,085,000 Springfield III.-Jan 8 Springfield Consolidated By ...... 100 750,000 750,000 tOn Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to \$20,827,200, of which \$18,276,000 is common and \$2,551,200 preferred. # Exactly acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co. Springfield 0.-Jan 8 Springfield Street By ..... 100 1,000,000 1,000,000 11 Springfield, Mass.-Jan 8: ALLIED INDUSTRIES. Springfield Street Ry..... 1,166,700 8 % A. 100 1,200,000 207 212 Toronto Canada.-Jan 8 Boston Mass.-Jan 8: BOSCOII MESS.—anno. Delaware Gas Light Co........com. Delaware Gas Light Co.......pref. American Electric Heating Co....... Street Ry. & Illuig Properties...pfd. United Electric Securities Co...pfd. 100 6,000,000 4,000,000 6,000,000 134 % 8. 4,000,000 4 % 8. 105% 72% 98 500,000 500,000 200,000 J. & J. J. & J. Washington, D. C.-Jan 8: 1,248,700 \$2 p. sh. Jan. 26, '99 1,000,000 \$3.50 p.sh. Nov'98. 4,500,000 943/ 91% New York.-Jan 8: 40 Onsolidated Electric Storage Co... Safety Car Heating & Lighting Co... Worthington Pump Co.....com. 100 Worthington Pump Co......pfd 100 10 150 **30** 155 5.500,000 5.500,000 2,000,000 T % A 109 110 8,000,000 2,000,000 550,000 8,000,000 2,000,000 542,500 1,200,000 37 108 8**5** 29 105 Philadelphia Pa.-Jan 8: Philadelphia Pa. dana . Electro Pneumatic Trans. Co...... United Gas Improvement Co...scrip. Welsbach Commercial Co...com. Welsbach Commercial Co...pfd. Welsbach Light Co...... 10,000,000 8,500,000 500,000 525,100 500,000 Wilkesbarre, Pa.-Jan 8 115/4 57 5/ 87 5/ 17/6 1)7/6 57% 88 Wilkesbarre & Wyoming Val. Trac. 100 5,000,000 5,000,000 1%, Jan., '97, 2 % Q \*Unlisted. † Paid in. ‡ Full paid. † Outstanding § Ex-div. a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6% on stock per annum. b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company. c Practically all shares owned by Union Traction Company. d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co. e Leased to Ecctric Traction Company. f Controlled by Frank ford & Southwark Passenger Rallway. g Leased to People's Passenger Rallway. g Leased to People's Passenger Rallway. f Lase d to United Traction Company. i Lease transferred to Union Traction Company. j Leased to United Traction Company as rental of \$10,000 per annum in 1866-7-8 p.a. \$20,090 in 1879-1900 and \$30 0 0 per annum thereafter, psyable semi-annually, rertal declared as a dividend semi-annually. k Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% guaranteed by Reading Traction Company. I Dividend of 10% gu 25 ë 170 168 26 100 1,000,000 2,500,000 20 98 ïŸ 48 96 4 47 52 105 1.250,000 1% % Feb. '98 1.250.000 8 52 2 % Sept 1,'98. 95 500,000



# BONDS.

PASSENGER RAILWAY.							PASSEN	GER R	RAILWA	Y.			
	Amou		Verbananh				Amo	Amount.		T-4			
NAME.	Authorized.	Issued.	Due	interest periods.	Bid.	Askol.	NAME.	Authorised.	Issued.	Dze	perfeds.	BildL	Anima
Albany N. Y.  Date of Quotation—Jan 8, 1900 The Albany By	8500,000 750,000 850,000 150,000	\$29,000 427,500 875,000 850,000 150,000	1940 1947 1919	J. & J. M. & N. M. & N. M. & N.	*128	127¼ 127	"New Orleans La.  Date of Quotation—Jan 8, 1900  Canal & Claiborne RR cons mig. 8s. Crescent City RR	\$150,000 5,000,000 416,500 5,000,000 850,000 800,000 800,000	50,000 8,000,000 899,000 2,599,500 850,000 800,000	1899 1948 1908 1948 1907 1912	J. & D. J. & J. F. & A.	105½ 108 112	112 118
Albany Ry. Co.  Baltimore Md  Date of Quotation - Jan 8, 1100  United Electric Ry. Colst mtg. g. 4s  Baltimore City Pass. Rylst mtg. 5s. Baltimore Traction Colst mtg. 5s. Baltimore Trac. Co. Exten. & Imp. g. 6s, Bal. Trac. Co. No. Balto div. Ist mtg. g. 5s. Baltimore Traction Co. Convertible 5s. Central Pass. Ry. Colst mtg. 6s. Central Pass. Ry. Colst mtg. g. 5s. City & Suburban Rylst mtg. g. 5s. Lake Roland Elev.,lst mtg. 5s.	88,000,000 14,000,000 2,000,000 1,500,000 1,250,000 750,000 800,000 96,000 96,000 8,000,000 1,000,000	1,500,000 1,250,000 1,750,000	1949 1911 1929 1901 1942 1900 1906 1912 1982 1922	J. & D. M. & N. M. & N. M. & S. J. & D. J. & J. N. & M. J. & J.	102 7434 11878 119 104 % 121 101 102% 119 116 117	102½ 75 120 121½ 	1890,000 outstanding.  New York  Date of Quotation—Jan 8 1500  Atlantic Ave. (Brooklyn)lmp. g. 5s. Atlantic Av. (Brooklyn)lstgen. mtg. 5s. †Atlantic Av. (Brooklyn)lons. mtg. 5s. Broidway & 7th Avelst mtg. 5s. Broadway & 7th Avelst mtg. 5s. Broadway & 7th Avelst mtg. 5s. Broadway & 7th Ave2d mtg. 5s. Broadway Surface2d mtg. 5s. Broadway Surface	759,000 8,000,000 12,500,000 1,500,000 500,000 1,125,000 1,000,000 2,000,000 1,000,000 250,000 8,500,000 4,500,000	1,966,000 7,650,000 1,500,000 1,125,000 1,125,000 6,000,000 2,000,000 448,000 250,000 8,500,000 2,750,000	1909 1981 1948 1904 1914 1924 1905 1941 1989 1988 1941 1941	M. & S. A. & O. J. & D. J. & D. J. & J. J. & J. J. & J. J. & J. M. & J. M. & N.	95 107% 115 128 104 108 115 105 116 115 101 104 112 107	110 116 125 105 110 117 116 117
**En All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.  **Boston, Mass.**  **Date of Quotation—Jan 8, 1400  **tLynn & Boston RRlst mtg. g. 5s.  **West End Street RyDeben. g. 5s.  **West End Street RyDeben. g. 5s.  **##################################	8,000,000 2,000,000	8,702,000 8,000,000 2,000,000	1902	J. & D. M. & N. M. & S	111 1041/ <sub>2</sub> 112	115 106	Bleecker St. & Fuli'n Fer'y RR. Ist mig. 7s Cent's Orent's Central Orosatown RR 1st mig. 6s. Coney Island & Brooklyn RR. 1st mig. 6s. Coney Island & Brooklyn RR. 1st mig. 6s. Coney Island & Brooklyn RR. 1st mig. 6s. Ed. D. Dock, E. Bd'y & Bat'y R. gen.mig. g. 5s. Dry Dock, E. Bd'y & Bat'y R. gen.mig. g. 5s. Lighth Av. RR. Co Oert. indebt. 6 %. Eighth Av. RR. Co Oert. indebt. 6 %. Eighth Av. RR. Co Oert. indebt. 6 %. Ed. St., Man. & St. N. Av 2d mig. inc. 6s. 42d St., Man. & St. N. Av 2d mig. inc. 6s. 42d St., Man. & St. N. Av 2d mig. inc. 6s. 42d St., Man. & St. N. Av 2d mig. inc. 6s. 42d St., Man. & St. N. Av 2d mig. inc. 6s. 42d St., Man. & St. N. Av 2d mig. 5s. Metropolitan St Ry Co. g. m. cl. tr. g. 5s Second Avenue Ry Oeb. 5s. Second Avenue Ry Deb. 5s. Steinway Ry. (L. I.) 1st mig. g. 6s. Third Avenue RR 1st mig. g. 5s. Third Avenue RR 1st mig. g. 5s. Twenty-third Street Ry 1st mig. g. 5s.	700,000 1,200,000 250,000 1,000,000 1,100,000 1,200,000 1,500,000 12,500,000 12,500,000 12,500,000 12,500,000 15,600,000 15,600,000 15,600,000 15,600,000 15,600,000 15,000,000	800,000 1,100,000 1,000,000 1,200,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 850,000 5,000,000	1900 1902 1922 1903 1932 1914 1914 1910 1915 1998 1997 1909 1922 1919 1987	J. & D. M. & N. J. & J. J. & D. F. & A. F. & A. F. & A. M. & S. J. & J. M. & S. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J.	103½ 101½ 101½ 107 125 101 117 102 108 116½ 89 124 120 120 178½ 116 110½	108 109 109 120 105 117 125 121 109 117 1128
Chicago III.  Date of Quotation—Jan 8, 1800  Ohicago City Ry	400,000 1,000,000 7,500,000 1,500,000 4,040,000 7,574,000 15,000,000 8,171,000 500,000 2,500,000 4,100,000 2,700,000	2,500,000 2,500,000 8,969,000 700,000	1908 1929 1929 1907 1982 1928 1942 1906 1911 1900 1927 1928 1911	J. & J. J. & J. J. & J. F. & A. J. & J. J. & J. J. & J. M. & N. J. & D.	1013/4  1081/4  108 106  108 101 1065/8	1021/4 102  109  96/4  111 102 107	Twenty-third Street Ry	500,000	2,000,000	1942 1943	J. & J. F. & A J. & J. M. & S. M. & S.	106 118 110	118
West Chicago St. R.B Con. mtg. g. 5s.  IW. Ohicago St. R.R. Tunnel Ist mtg. 5s.  Redeemable at option on 60 da. notice.  IFunded debt assumed by Ohicago W.  Div. Ry. Co., controlling interest of which is owned by W. Ohicago St. R.B.  Oo., lessee.  Subject to call after Oct. 1, 1899, at 110 and interest.  Jassumed by W. Ohi. R.R. Oo., lessee.  IIIt. guar. by W. Ohicago St. R.R. Co.  Cincinnati, O.  Date of Quotation—Jan 8, 1900  Din. New. & Cov. St. Ry. Ist Con. mtg. g. 5s  Mt. Adams & Eden P'k In Ist mtg. 6s.  Mt. Adams & Eden P'k In Ist mtg. 6s.  Mt. Adams & Eden P'k In St mtg. 6s.  Oov. & Oin. St. Ry 2d mtg. 6s.  So. Oov. & Oin. St. Ry 2d mtg. 6s.  4 Assumed by the Oincin. St. Ry. Co.  §2550,000 reserved to retire 1st mtg. bds.	8,000,000 46,000 100,000 581,000	2,500,000 46,000 100,000 581,000 250,000	1922 1900 1905 1906	F. & A.	113 % 108 % 114 108 % 121 % 182 %	1141/4 104  1221/4 187	Date of Quotation Jan 8, 1100 Continental Pass. By	800,000 100,000 150,000 250,000 1,125,000 5,698,210 200,000 1,800,000 29,785,000 29,785,000 750,000	250,000 458,000 867,000	1898 1901 1905 1911 1912 1948 1910 1917 1908 1911 1945 1905	J. & J. J. & J. M. & S. J. & J. F. & J. A. & O. A. & O.		
Cleveland, O.  Date of Quotation—Jan 8, 1400.  Brooklyn Street RR. Co1st mtg. 6s. fin. New't & Cov. St. Ry Cons. mtg. 5s. Cleveland City Cable Ry1st. mtg. 5s. Cleveland Electric Ry.Co. 1st mtg. g. 5s. Cleveland Electric Ry.Co. 1st mtg. g. 5s. East Cleveland RR1st mtg. 5s. ft. Wayne (Ind.) Elec. Ry. 1st mtg. 5s. ft. Wayne (Ind.) Elec. Ry. 1st mtg. 6s. St. Ry. Co., Grand Rapids 1st mtg. 5s. St. Ry. Co., Grand Rapids 1st mtg. 5s. St. Ry. Co. Grand Companies, marked a. Interest cuar by Cons. St. Ry. Co.  Detroit, Mich.	600,000 8,000,000 2,000,000 8,500,000 1,500,000 1,000,000 600,000 200,000	2,500,000 2,000,000 1,249,000 1,500,000 1,000,000	1922 1909 1918 1918 1910 1922 1915	M. & S. M. & N.	1061/4 1181/4 1051/2 106	107 114 ½ 106 107 107½,	Date of Quotation—Jan 8 1500  Birmingham, Knox & Allentown	750,000 250,000	1,250,000 750,000 250,000 750,000	1980 1927 1980 1918 1942 1928 1924 1927 1929 1922 1980 1984	A. & O. J. & J. J. & J. J. & J. M. & N. J. & J. A. & O. M. & N. J. & J.	110	118
Date of Quotation—Jan 8, 1100 Detroit Citisens' 81, Ryist mig. 5s.  "I. Wayne & Belle Isle RyIst mig. 5s.  "he Detroit Ry	7,000,000 400,000 1,800,000	8,885,000 877,000 1,800,000	1902	A. & O.	105	102½ 106½	Providence R. I.  Date of Quotation Jan 8, 100  Newport Street By	50,000 4,000,000	50,000 8,260,000	1910	J. & D. M. & S.	114	118
Date of Quotation—Jan 8 1100.  New Haven St. Rylst mtg. g. 5s.  New Haven (Edgewood Div.) lst. mtg. g. 5s.  Winchester Avenue RR—lst mtg. g. 5s.  Winhester Avenue RR,Deben. g. 5s.	600,000 250,000 100,000 100,000	600,000 250,000 500,000 24,000	1914 1912	J&D M&N M&S	111 111 109	 •Un	Baden & St. Louis RR	£000 000 2,000.000 2,000,0 0 1 000 000	250,0°0 1,90°,000 1,500,000 000 000	1912 1907	J&J J&J J&J	102 102 1093 1736	100 104 11c

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PASSENGER RAILWAY.									
	Amou	Issued.	Due	Interest periods.	Bid.	Asked.			
NAME.	Authorized.	1854047	L	perious.	Dia.				
St. Louis.  Date of Quotation—Jan 8, 1900									
lefferson Avenue Bylst mig. 5s. Lindell By. Colst mig. 5s	400,000 1,500,000	1,500.000	1911	M. & N. F. & A.	104 107	105 108 106			
Missouri RB. Co	1,000,000 400,000 125,000	700,000 800,000 125,000	1910	M. & S. A. & O. J. & D.	105 100	102			
People's RK. CoCons. mtg. 6s.	75,000 1,000,000	75.000 800,000	1902 1904	M. & N. J. & J.					
St. Louis & E. St. L. Electric.lst mtg. 69.  1. Louis BR. Colst mtg. 58.  381. Louis & Sub. Bylst mtg. g. 58.	75,000 2,000,000 2,000,000	75,000 2,000,000 1,400,000	1905 1900 1921	M. & N.	991% 104	101 1 0% 105			
i. Louis & Sub. RyIncome 58.	800,000 500,000	800,000 500,000	1909	M. & N.	80 105	84 107			
Taylor Avenue St. Rylst mig. g. 6s. Union Depot RR. Colst cons. mig. 6s. Union Depot RR. CoCons. mig. 6s.	500,000 1,091,000 8,500,000	500,000 1,091,000 1,787,000	1900		1161/4 100 1211/4	118% 101 122%			
†Controlled by St. Louis RR. Co. †Controlled by Union Depot RR. Co. †Controlled by Lindell RR. Co.									
[\$200,000 in escrow to retire 1st & 20									
mtg. 38600,000 in escrow. ††\$200,000 in escrow to retire 1st mtg.									
San Francisco Cal.									
Date of Quotation - Jan, 1900.  California St. Cable BRlst mtg. g. 5s. Ferries & Cliff House Bylst mtg. 6s.	1,000,000 650,000	900,000 650,000	1915 1914	J. & J. M. & S.	114	11 <b>7</b> 117			
Geary St., Park & Ocean RBist. mtg. 58. Market St. Cable Ry. Colst mtg. g. 68.	1.000,000 8,000,000	671,000 8,000,000	1921	A. & O.	126	95			
Metropolitan Ry. Colst mig. fOmnibus Cable Colst mig. 6s. †Park & Cliff House BRlst mig. 6s.	200,000 2,000,000 850,000	2,000,000 850,⊍00	1918 1912	A. & O. J. & J.	126 × 105 ×	107			
Park & Ocean RRlst mtg. 6s.	250,000 700,000	250 000 700,000	1914 1912	J. & J. M. & S.	115	125			
†Controlled by Market St. By. Co.	1,000,000	900,000	1219	M. & N.		•••••			
Washington D. C.  Date of Quotation—Jan 3, 1900.	500,000	450.000	1920	J. & J.					
Belt Ry. Co	500,000 200,000	500,000 200,000	1914 1911	A. & O. J. & D.	182	••••			
Metropolitan BB. CoColl tr. cons. 6s. †\$50,000 in escrow to retire 1st mtg.bds.	500,000	500,000	1901	J. & J.		•••••			
Miscellaneous.  Date of Quotation—Jan 8, 1900.									
oridgeport Traction Colst mtg. 5s. duffalo (N. Y.) By. CoCons. mtg. 5s.	5.000,000	1,688,000 8,548,000	1931	F. & A.	108 118	110			
tizens' St. R. (Ind'polis).1st cons.m.5s Crosstown St. Ry. (Buffalo)1st. mtg.5s. Columbus (O.) St. Ry1st cons. g. 5s.	8,000,000	8,000,000 2,366,000 2,261,000	1932	M. & N.	101 112 15	10°			
Crosst'n St. Ry. (Colu's, O.)lst mtg.5s	2,000,000	18,965,000 572,000	1938	J. & D. J. & D.	11:¼ 115	1113% 115%			
Denver Oity Cable Rylst mtg. g. 6s. Denver Con. Tram'y CoOon. m. g. 5s. ouisville (Ky.) Rylst cons. mtg. g.5s.	6,000,000	8,800,000 922,000 4,981,000	1938 1930	A. & O. J. & J.	20 80 1:9	85 1191/2			
Minneapolis St. Ky. 181 cons. mtg. g. 58 †No. Hudson Co. Ry. (N. J.). Cons. mtg. 58	5,000,000 8,000,000	4,050,000 2,878,000 550,000	1928	J. & J. J. & J.	110¾ 108	110%			
No. Hudson Co. Ry. (N. J.)Deb. 68. Aterson (N. J.) RyCons. mtg. g. 68. Bochester (N. Y.) Bylst mtg. 58.	500,000 1,250,000	439,000 1,000,000	1902 1931	F. & A. J. & D.	• • • • • • • • • • • • • • • • • • • •				
Mochester (N. Y.) By	0.500,000	2,000,000 4,298,000 1,000,000	1937	A. & O.	105½ 103	106			
181,000,000 in escrow to retire let and	1	2,000,000			100	••••			
d mtg. bds. 18800,000 in treasury. Bonds guar. by Buffalo Ry. Co.	1				Ì				
C. Si. RR. Co.	Į.								
1487,000 in treasury. 18360,000 resived to redeem prior liens 48320,000 in escrow.	•								
ELEOTRIC LIGHT AN	D ELE	CTRIC	DA	L MF		int'rest			
Boston, Mass Date of Quotation—Jun 8 1100		1							
Delaware Gas Lt. Co.,lst m. 5s, g Edison Elec, Illuminating Oo., Boston	2,026,000	300,000	ı	J. & J. Quar.	106 157				
General Electric Cogold coup, deb. 5c. Pittsburg Pa	10,000,000	8,750,000	1922		116	•			
Date of Quotation - Jan 8, 1900 Allegheny County Light Co	500,000		191		110				
Westinghouse Elec. & Mtg. Co. Scrip 6s Viscellaneous.—(Jan 8, 1900.)	195,570			M. & S.	• • • • • • • • • • • • • • • • • • • •				
dison El. Illg. Co. (N. York) 1st m. 5s. Edison El. Illg. Co. (N. Y.) con. m. g. 5s	4,312,000	4,812,000 2,188,000	1993	3	109 124	194			
Edison Electric Light (Philadelphia)	2,600,000	2,500,000	1	A. & O.	1223/	1:0			
Kings Oo. El, Lt. & Po. Co.pur. money 68 Wilwaukee El, Ry & Lt. Co.lst con. g. 58	8,000,900	5,176,000 6,103,000		F. & A.	120 1025				
United Ricc. Light & Power Oo(N. Y.) TELEPHONE		TELE	GR		1	1			
Miscellaneous.  Date of Quotation—Jan 8 1100									
American Bell Telephone			1898						
N.Y. & N.J. Telep & Telg Oo. gen.mtg.5 Unesapeake & Potomac Teleph. Oo5	8	:	191	J. & D	1'4	115			
Misselleneous	INDU	STRIE	<u>s.</u>	<del></del>		1			
Miscellaneous.  Date of Quatation—Jan 8, 1900	500.000	<b>5</b> 30 069							
American Electric Heating		P.00 069	194	2 J. & J	106	25			
Worthington Pump Co	75,000		190						
Unlisted Nomin	aı,								

#### NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 164@17e.; Lake, 17@174e.; casing, 164@164e.

A decree of foreclosure has been entered against the Carbondale (Pa.) Traction Company on \$450,000 mortgage bonds.

The South Side Elevated Railroad, Chicago, carried 22 627,810 passengers in 1899, an increase over I898 of 19 7 per cent.

It is stated that the Chicago Edison Company will issue on February 1 the \$1,000,000 new stock authorized some time ago.

It is rumored that the Philadelphia Electric management has practically decided to declare a dividend on the stock in February.

Production of refined copper by the lake mines in 1898 was 157,835,729 pounds. The estimate of 1899 production is 157,500,600 pounds.

The Madison Gas & Electric Company of Madison, Wis., has declared a dividend of 2½ per cent., payable January 20 to stock of record January 10.

The Washington Electric Vehicle Company, incorporated last May in Trenton, N. J., filed papers last Friday decreasing its capital stock from \$6,000,000 to \$1,250,-000

The Pacific Coast Telephone Companies made a net gain of 2,218 subscribers in December and had in operation on December 31st 64.538 instruments. The net gain for the year was 19.552.

The New Paltz & Walkill Valley Electric Railroad operating in this State has been sold at auction under foreclosure of the mortgage securing bonds issued for the construction of the line.

The National Gramophone Corporation has declared its regular monthly dividend of 1 per cent., payable January 16. Books closed January 6 and reopen January 17.

The New York & New Jersey Telephone Company has declared a quarterly dividend of 1½ per cent. and an extra dividend of 1 per cent., payable January 15 to stock holders of record January 5.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 21/625; New York Electric Vehicle Transportation, 11@114; New Elegland Transportation, 64%7.

The New Haven Electric Company at d the Bridgeport Electric Company have been absorbed by a new corporation, the New Haven Illuminating Company. The latter will issue \$1.00,000 in stock to cover purchase.

Gross earnings of the Metropolitan Street Railway Company (New York) for the month of December, were \$1.268.54!—whead of December, 1898, by \$164,389; from July 1 gross aggregates \$7,140.614, a comparative increase of \$948,667.

Exports of manufactures from the United States for the calendar year 1897 were \$279,652.00, and in 1899 \$3.7 925.00. For eleven months of 1899 to December 1 the total is \$344,88,000—indicating for the full year, approximately, \$389,000,000, an increase of 23 per cent.

The N w York State Railroad Commissioners have consented to the assuance by the Coney Island & Brooklyn Railroad Company of \$200,000 mortgage bonds. The bonds are to be issued under a mortgage dated May 20, 1898, under which but \$890,000 bonds were issued at the time.

The directors of the People's Tramway Company of Killingly, Conn., have authorized an issue of \$600,000 thirty year five per cent. first mortgage bonds, of which \$200,000 are to be put out by the Colonial Trust Company of Waterbury. Later reports go to confirm the acquirement of control of the property by the New Haven Railread Company.

Stockho'ders of the Consolidated Traction Company of Jersey City will receive, on January 15, a dividend of two per cent, which the directors declared at a meeting held in Jersey City last week, on the capital stock of \$15,000,000. The dividend will be paid out of \$300,000 which the company received from the North Jersey Street Railway Company, which has leased the Consolidated's plant

On January 8 the Mayor of New York City signed the resolution of the Municipal Assembly granting franchises to the Metropolitan Street Railway Company and the Third Avenue Railread Company for extension of their present lines north along Broadway, Eleventh avenue and Kirgsbridge road to the city limits. The franchises will not have to be sold at auction, because they are extensions of existing roads. The grant is for twenty five years, with compensation to the city at the rate of four, six, eight and ten per cent. of gress receipts.

The gross earnings of the Chicago Union Traction Company for December were \$621,614, an increase of \$33.635 over the earnings of the North and West Chicago systems in the same month of IS98. Of this increase, \$22,958 was derived from the West Chicago lines and \$10,677 from North Chicago. The total earnings of the Union Traction for the half year it has operated the North and West Chicago systems are \$3.868.666, an increase of \$262,782, or a fraction above 7 per cent. over earnings in the same period of IS98.

The Consolidated Gas Company of New York City has acquired the controlling interest in the New York Gas & Electric Light, Heat & Power Company. The xact basis on which the Consolidated bonds will be exchanged for the other company's stock has not yet been determined. The authorized capital stock of the New York Gas & Electric Light, Heat & Power Company is \$36,000.000, and it is supposed that most of this is curstanding. It is believed that \$5,000.000 of the Consolidated Gas bonds will be more than ample to acquire a controlling in erest in the New York Gas & Electric Light, Heat & Power Company's stock.

with a capital of \$16 000,000 the Consolidated Railway E actric Light & Equipment Company was incorporated on January 7 at Trenton, N. J. The company is empowered to make use of electric light and power and also to manufacture gas. The incorporators are William W. White, New York; Frank C. Rowley. Booklyn, and Walter C. Butler, West Orange. The object of the company is to combine the various concerns now engaged in the electric ard gas lighting of steam and electric cars. In time it is understood that the Pintsch Light Company will become part of the new combination.

A million dollar mortgage, given by the Utica Electric Light and Power Company to the Trust Company of America was filed with the Obeida. N.Y., county clerk recently. After the consolidation of the Utica Electric Light Company, the the Utica Electrical Manufacturing & Supply Company and the Trenton Falls Electric Light & Power Company into the Utica Electric Light & Power Company, it was decided to issue first mortgage five percent sinking fund 50 year gold honds of \$1,000 each, payable January 1, 1959. Only \$1,000,000 of the bonds have been issued. There was also filed a mortgage, given by the Clinton Electric Company to the Kings County Trust Company of Brooklyn for \$50,000 each; gas percent interest and payable December 15, 1919. The mortgage was given to secure first mortgage bonds of \$1,000 each,





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derstood. Rates will be sent on application.
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### EDITORIAL NOTES.

Too Much Stock and Too Much Manipulation.

The sudden drop, just before the holidays, in the value of the securities listed on the New York Stock Exchange, and to

which we referred in a shortarticle in our issue of December 20, has elicited an interesting article from the Philadelphia "Manufacturer," which appears in the January 1 issue of that journal. After referring to the fact that the sudden decline was brought about through the reverses met by the British in South Africa and to a stringency in the local money market, and that the prosperity of the country generally was not affected in the least, the article referred to says:

"The situation is every bit as healthy as it was, and in most manufacturing industries the position of the companies is becoming better all the time, as not a few are just beginning to get into the work which was taken at the higher price level. As for the railroads, they are the servitors of industry. They catch freights going to and coming from the busy mills. They reap benefits from the prosperity of the people, both in passenger and goods accounts, and they are getting higher rates for traffic, which will assuredly increase the income and general strength of the properties. There may be a few companies which intended to pay dividends by selling stock that they still held in their safes. Such as these will not be pleased at the outlook, but the sooner they are out of the way the better it will be for everybody concerned."

In other words, our contemporary takes the stand that we always have, that a concern that is obliged to add water to its stock in order to pay a dividend, is far better out of business than in, and it might be added that the securities of such a concern have no business to be listed on any reputable exchange. The principal cause of the trouble is aptly summed up in the following paragraph:

"We all know, and attention has been called to the fact again and again in the newspapers, this one among them, that the development has been going forward too rapidly. Too much stock was being issued. There was too much manipulation in the share markets and prices were being realized for many securities far out of proportion to their value. Plants were brought together which were passé and obsolete. Property was valued at \$30,000,000 which was only worth \$10,000,000, and although the public was in some cases on its guard and was only paying the price of \$10,000,000 for the stock, in other cases there was eager buying on a much higher scale of valuation. These stocks, as might be expected, were the first to suffer. Those which had risen most rapidly and the farthest, exhibited the same symptoms when the start was made in the other direction. The conditions in this respect were not healthy, and the market has been hyper-sensitive on this account ever since the present financial movement in the industrial world first began. There comes a time, as every chemist knows, when a thing absorbs all it can take in. It reaches the point of satiety. So with the investment market. The people had got full of stocks. All the money available for this purpose was placed, and trouble was not far away. Deaths of leaders in politics or finance, famines, or other disorders, which are of a very slight or indirect bearing upon the market, were liable to produce sudden and marked fluctuations in value."

And that was just what occurred in December and that will occur again. Trusts have been organized in every conceivable line of industry and without the least excuse for their existence. The stock of amalgamated companies has been increased far beyond the value of the assets, with the result that there are numerous financial bubbles floating about today that will some time burst and cause widespread panic and financial disaster. Fortunately, most of the banks are extremely conservative so far as loaning money on industrial securities is concerned, so that when the crash does come, as it inevitably will, the principal sufferers will be the speculative public, who, in spite of ample warning, continue, as our contemporary once said, to bite at red rags.

\* \* \*

Incandescent Lamps. In a recent lecture before the Brooklyn Institute of Arts and Sciences Mr. William S. Barstow, well

known to the electrical fraternity, discussed the incandescent lamp and gave among other things some interesting statistics as to the growth of this branch of industry. During the talk Mr. Barstow showed various types of lamps and filaments and explained in a general way their method of manufacture. Referring to the methods of lighting now generally in

vogue in large communities, Mr. Barstow said:

"In large cities we know of two distributed methods of illumination—gas and electricity. In the gas business the quality of light depends upon the quality of gas, the 'tip' only controlling the quantity. In electric light the quality of the light is dependent mainly upon the burner; that is, the lamp. Hence, what is good practice in the gas business is often entirely wrong in the electric light industry. Unlike the gas light, the consumers control to a large extent the performance of the lamps in their premises, the central station simply keeping the energy at a constant pressure."

The speaker then commented on the growth of the incandescent lamp industry in this country as follows:

"The incandescent lamp is now in its twentieth year, and from its beginning, at Menlo Park, the progress has been rapid, until at the present day the total production in the United States alone is about 20,000,000 per year, and the different varieties and forms in which the lamp appears number over 147,000. From a few hundred dollars during the first year, the amount expended for lamps has annually increased, until during the past twelve months there will have been expended about \$4,500,000. The price of the lamp itself has been reduced from \$1 to an average of 18 cents per lamp, and even at this low figure the profit is quite as much as in the early days."

The fact that the manufacturer reaps as large a profit now with lamps selling at about 18 cents as in the early days of incandescent · lighting when the Edison lamp sold for \$1 is readily explained in the improvements of manufacture that have gradually been inaugurated. And yet, although improvement after improvement has been made in the method of manufacturing the incandescent lamp, until it sells for one-fifth less to-day than what it did eighteen years ago, the efficiency of the lamp in its present shape is but three times that of the lamp of twenty years ago. In other words, the improvement in the lamp itself would scarcely seem to have kept pace with its method of manufacture. In his lecture Mr. Barstow said:

"Yet, during all this advance of twenty years, the shape or principle upon which the lamp is manufactured has remained the same. While revolution after revolution has occurred in the electrical engineering field, the incandescent lamp to all intents and purposes has held its own, and to-day the vacuum lamp is the only type in general use."

That this type of lamp has, as Mr. Barstow states, held its own is due to the fact that in the past fifth of a century no better lamp has been brought out, but that there is room for improvement may be inferred from the fact that but a small fraction of one per cent, of the power liberated from coal or derived from running water is converted into luminous energy or light. Whether the Nernst lamp will ultimately prove the illuminating medium of the near future, as some seem to think, remains of course to be seen. Mr. Barstow referred to it in the following words:

"This lamp is of exceedingly high efficiency, almost twice that of the present lamp. Its main difficulty at present is the fact that some outside method of heating the incandescent portion must be used before it becomes a conductor. Within the last few months a thermostat socket has been used which causes the current, when the lamp is first turned on, to flow through a small coil of wire placed beneath the incandescent material, and as soon as this

material becomes heated and becomes a conductor, the coil of wire is cut out of the circuit What the outcome of this lamp will be it is hard to state, but for the immediate future the present form of lamp will continue to furnish electric light in its incandescent form."

\* \* \*

No Need of a
"Telephone Bill"
This Year.

At every session of the New York Legislature for the past half dozen years there has been introduced one or more

telephone bills looking to the reduction of telephone rates in New York City. These bills, which have appeared as regularly as the Legislature has met, have been as regularly killed or relegated to the so-called "Committee on Cold Corpses,"

So far this year, to the best of our knowledge, no such telephone bill has been introduced into the Legislature now in session at Albany, and truth to tell there would seem little need for such a measure. As we have several times stated in these columns, relief from high telephone rates, would in all probability, be brought about through healthy competition and not by a drastic legislative measure, and the present condition of affairs in the telephone field in this city would seem to bear us out in our original opinion.

The Telephone, Telegraph & Cable Company of America, through the Knickerbocker Telephone Company, which latter organization bears much the same relation to the former that the New York Telephone Company bears to the American Telephone & Telegraph Company, is making active preparations to furnish the residents of this city with a first-class independent service at reasonable rates. Referring to this subject recently, Col. William H. Eckert, president of the new independent company, is reported as saying:

"We will charge for unlimited service in the boroughs of Manhattan, The Bronx and Brooklyn \$120 flat for business offices and \$60 a year for residences. In the boroughs of Queens and Richmond we will charge business houses \$48 and residences \$36 for unlimited service in certain districts, with toll charges for points outside those districts, and the option of taking an unlimited service on the same basis as that offered in Manhattan, the Bronx and Brooklyn. With the lower rate a man living at Flushing, for example, could telephone at will in Flushing, but there would be toll charges to points outside of that place. The basis of tolls in Queens and Richmond will be about six or eight cents a message at the outside, as compared with the Bell company's charges of 15 cents.

"We are now actively at work laying our cables in the conduits. In Manhattan we are using the ducts of the Empire City Subway Company. In Brooklyn we will have our own ducts. Within a few days I expect we will have about four miles of cables laid, and perhaps we will be able to send, experimentally, the first independent message in this city. We are equipping as a main central exchange the building at 416 Broome street, and are also equipping another exchange on East Twentythird street, between Fourth and Lexington avenues. There will ultimately be, perhaps, twenty exchanges in Manhattan and Brooklyn. We have not yet begun canvassing for subscribers, but will do so at once. We won't charge for our telephones until we have wellequipped exchanges in operation and a large number of subscribers; probably we won't charge until we have at least 5,000 instruments in operation."

The apparatus that will be made use of by the Knickerbocker Telephone Company is covered by patents that in no way infringe on those owned by the Bell monopoly, so that no trouble need be apprehended on that score. It is also safe to say that one of the chief stumbling blocks encountered by other independent companies who have tried in vain in the past to compete with the local Bell concern, namely, no long-distance service, will be removed through the efforts of the Telephone, Telegraph & Cable Company of America, which is rapidly arranging for long-distance independent service to innumerable points throughout the country.

That it will take some time to install the necessary exchange apparatus and run the cables there is no doubt, but Col. Eckert expects the independent system to be in working order in from six to nine months, when the reasonable rates asked, about one-half those charged by the Bell concern, should insure the Knickerbocker Telephone Company a large and appreciative number of subscribers.

#### UNDER THE SEARCHLIGHT.

#### Notes and Comments on Various Topics.

WE are pleased to be able to announce authoritatively that notwithstanding rumors to the contrary the Wagner Electric Manufacturing Company's stock holdings have not been disposed of to any of its Eastern competitors. A detailed account of the annual meeting recently held by this company will be found elsewhere in this issue.

AFTER innumerable and protracted delays it now looks as though the residents of New York City are destined in the near future to enjoy real rapid transit, as bids looking to the construction of the underground system have just been opened, and providing of course no unlooked for hitch occurs at least a section of the line should be in operation in the course of a couple of years. Two bids were received from responsible contractors, one of \$35,000,000, the other of \$39,300,000. It is rumored that Vanderbilt interests are back of one of the bidders and Whitney interests back of the other.

The Delaware, Lackawanna & Western Railroad has equipped sixteen locomotives with electric headlights. Several were put in service on Monday. The Lackawanna is the first Eastern road to use this style of light. Storage batteries furnish the necessary power.

The Cascade tunnel of the Great Northern, one of the great railroad tunnels of the West, is rapidly nearing completion. The tunnel will be 13,253 feet in length, and its cost will exceed \$3,000,000. This tunnel has been excavated at a point where the Cascade range is the highest, and the distance from the roof of the tunnel to the pinnacle of the mountain through which it runs is 2,300 feet. When the tunnel is turned over to the railroad company, which it is expected will be in October next, the cars that will run through it will be operated by electricity.

SEVERAL schemes are now under consideration for the erection of new electrical works in Mexico. Two capitalists in the City of Mexico have applied to the State Government for a concession to establish two electric light plants there. The Topo Chico Street Railway, in the



City of Monterey, is being extended to the Mexican International Railroad depot, a distance of three miles. The street railway in Morelia is to be extended two miles. The San Luis Potosi Street Railway, which is at present a horse road, will soon be converted into an electrically-equipped line. The major portion of the material and equipment for the construction of all these enterprises will be purchased in the United States.

A COUPLE of Western inventors have recently brought out an electrically-operated railway crossing gate, which is said to be simple in operation, durable, and what is even more important, reliable.

PREPARATIONS are rapidly being made for holding the automobile show in Madison Square Garden, New York, next week. It is understood that a number of the largest automobile manufacturers in the country have taken space, and that many types of electrically-propelled vehicles will be on exhibition.

A RESIDENT of Syracuse, N. Y., is said to have invented and patented in the United States and foreign countries an improved apparatus for detecting a "break," or "ground" in a telephone, telegraph or electric light wire. The device as nearly as can be ascertained consists of a telephone receiver connected to the line, and of a graduated scale, the break apparently being located by means of resistances, in a somewhat similar way to the break in an ocean cable.

The Calcutta Tramways Company, Limited, which at present operates a single-track horse tramway in Calcutta, India, has, after protracted delays, received the necessary consent from the Bengal Government to run a double line, and to convert the road into electrical power. The new line will run from the heart of the city directly to the docks. The cost of the electrical equipment is estimated to exceed \$1,750,000. The bulk of the necessary material and apparatus will, it is understood, be purchased in this country.

The new United States cruiser Albany, formerly the Brazilian cruiser Admiral Abrouall, bought by this Government just before the beginning of the war with Spain, was given an official trial off Newcastle, England, last week. The test was most successful, the Albany averaging 19.54 knots per hour. A feature of this vessel is the searchlights, the reflectors of which are of metal instead of glass, made by a method devised by Mr. Cowper-Coles, and described in the issue of ELECTRICITY of March 2, 1898.

THERE are about fifty women in the United States, says the N. Y. "Commercial," who have taken a full or partial course in electricity, and are delving into the intricacies of the science for a living. The electric plants at Ellenville, N. Y., Bay City, Mich., and Saginaw, Mich., are run by women. There is one factory in New York that employs 300 women in making electrical goods. The large factory at Schenectady, N. Y., employs several hundred girls. Some are mere mechanical specialists, working day by day on the same part of electrical machinery, while many are well versed in the science of electricity and fill important positions in the factory. The best-informed woman in the world in regard to electricity is said to be Mrs. Bertha Ayrton, of London, wife of Prof. W. E. Ayrton, the noted electrical authority. She is distinctly a scientist, and her discoveries are recognized as being of great value. Miss Bertha Lamme of Pittsburg, is well known as an electrical engineer of high standing. She is on the staff of engineers of the Westinghouse Manufacturing Company of Pittsburg. Dr. Margaret Cleaves, formerly of Iowa, but now of New York, has won renown by her knowledge of electricity as a curative agent.

A RESIDENT of Brooklyn, N. Y., has invented a so-called serpentine boat by means of which he fondly expects to be able to cross the Atlantic in three days. The outside of the vessel is cigar-shaped and resembles an Archimedean screw, and is supposed to be driven through the water in much the same way that a revolving handle corkscrew pulls a cork. The nature of the power to be used in turning the vessel is not made public.

The defective insulation of an electric light wire resulted in the ignition of some woodwork in a Hillsdale, Mich., factory a short time ago. One of the employes threw a pailful of water on the blaze to extinguish it. The strong electric current passed through the connection made by the stream of water between the wire and the man holding the pail, giving him a shock that knocked him down.

ELECTRICITY is beginning to play an important part in church decoration, for at the present time there are at least two places of worship in New York City that have crosses that are electrically illuminated at night.

A NEW use has been found for electricity in the preservation of meat. It has been known for ages that meat could be preserved almost indefinitely by completely drying it, and meat so preserved has been in use in many countries. In America this product is known as pemmican, in the Argentine and most of South America as tasajo, in Chili as charki, in Africa as biltong, and by the Arabs as kilia. A chemist, says a daily paper, has discovered that electricity can replace the sun, besides being more effective. He exposed meat to the action of an electric current, and at the same time to a current of hot air. The meat was by this process welldesiccated. Not only this, but the electrically prepared pemmican is easily powdered, and is much more brittle than that prepared by any other method, making it better to pack and more handy for transportation. The electrical pemmican also has none of the disagreeable flavor which is a standing objection to most all of the other forms of its preparation. There is no reason why it should not form an agreeable substitute for canned beef for army rations.

The use of electricity is becoming more appreciated in almost every walk of life, remarks the London "Electrical Engineer." For instance, a man was recently arrested charged with being found on the roof of a jeweller's shop, for the purpose of committing a felony. On being searched, besides some some very fine specimens of housebreaking implements, there was also found a portable electric light set. This we should suppose was a great improvement on the usual means of lighting by members of this profession, comments our contemporary, owing to the ease with which it could be switched on and off, and the entire absence of smell.

The spectacle of men and women flying over the roofs of tenements to escape fires caused by the explosion of gas meters has become common in the neighborhood of upper Second avenue, New York City. The tenth recent fire of such origin occurred early Friday morning, and several tenants barely saved their lives. The officials of the Fire Department, inspectors of gas meters and employes of gas companies declare that they will exert their energies to furnish a remedy.

A BILL has been introduced into the Legislature at Albany providing for the placing under ground of electrical wires or conductors in New York City. If the owners or operators of any electrical conductors refuse to remove their poles, wires or other electrical conductors within the time limited by the Commissioner of Public Buildings, Lighting and Supplies, the said commissioner shall cause them to be removed and the expense of such removal shall be borne by the respective owners. The act, however, shall not affect any elevated railroad operated by electric power.

Nowhere have Signor Marconi's successful experiments with wireless telegraphy attracted more attention than in Germany, and soon after his work in this country during the international yacht races was completed the semi-official announcement was made in Berlin that similar experiments would be made in Germany in the near future. These tests have just taken place on the steamship Prince Sigismund and on a land station, which was erected at Laboe, near the entrance of the Kiel harbor. The tests were conducted under the auspices of the German Naval Society, and are said to have proved entirely satisfactory.

The results of the experiments recently conducted by MM. Jean and Louis Lecarme to determine the practicability of space telegraphy between two points of different altitudes, with the consequent difference in atmospheric pressure, have been presented to the Paris Academy of Sciences. The region chosen was that of the Alps, and the transmission was carried on between Chamouni and Mount Blanc. The transmitting station was established at the substation of the observatory of Vallot, at Chamouni, having an altitude of 3,000 ft., the receiving station being installed at another substation of the observatory on Mount Blanc; this point is at an altitude of 13,800 ft., thus giving a difference of level of 10,800 ft. between the two stations, which were about seven miles apart. The soil between these two points, says "Industries and Iron," London, is covered with ice, except at the part immediately surrounding the stations. The information obtained by these experiments may be summed up as follows: 1. The signals were very clear under the conditions named, with a distance of oscillator spheres equal to one inch. 2. The absence of water in the liquid state did not prevent communication. 3. The presence of clouds between the stations had no effect upon the signals. 4. The atmospheric electricity could not, on the whole, be said to have had an injurious effect upon the practical transmission of signals. 5. Another point observed was the action of the three-phase, 2.500 volt electric lighting system at Chamouni, which had a decided effect upon the apparatus, and it was impossible to work while the station was in operation.



#### THE FUTURE OF ELECTRIC ILLU-MINATION.

BY JEAN WETMORE.

#### PART III.

The wrong tendencies of Underwriters' rules and lack of backbone on the part of insulated wire manufacturers have not been the only ills that electric illumination has fallen heir to, or the only causes of expensive and involved construction.

The lowering of the grade of these necessary adjuncts called for more complicated and expensive additions as supernumeraries to guard against the evils that resulted. The cure was found in the old homeopathic maxim, similia similibus; thus another evil was indicated to counteract the first cure. Poison with poison that was the idea, for when the degenerate insulations failed to insulate it was found an expensive and troublesome undertaking to repair them, so the birth of another idea occurred as a nightmare to cheap construction—it was an asphalted paper tube to be buried in the walls. The architects became enthusiastic over the idea of being able to replace defective insulation with little trouble, as well as to be able to draw in wires at any time after the completion of a building. Such constructions possessed the additional advantage of wiring suburban structures at a future time when there should be an extension of the electric mains.

The manufacturers of this new product claimed that their paper tubes were sufficient insulation of themselves, and that simple cotton covered wires and even bare wires could be used in this wonderful tube with absolute safety. These tubes were fireproof, of course, and salesmen made demonstrations that convinced the unsophisticated; but one of the foremost installations, the Edison Building on Broad street in this city, had its paper tube conduits burned out through imperfectly insulated wires and the fire was carried from floor to floor as through an elevator shaft, and thus the city came nearly losing another one of its fire-proof structures.

These tubes were claimed to be waterproof, but it was early discovered in a Pittsburg building that water soaked them through and through, and when the old wires were withdrawn the tubes pulled apart and the patience of a Job could not thread new ones through them again.

These conduits we loudly heralded as proof against lime, and yet an installation in the Edison station at Milwaukee soon proved that vestiges of them only remained when the plaster was removed.

They were also claimed to be rat and mice proof, but these animals found them, when seeking runaways, easier to destroy than the concrete and iron construction.

It was also found that moisture condensed within, when the warm atmosphere circulated through them from without.

So defective were they found at last that the promoters of these shams finally declared that bare and cotton covered wires could not be recommended as at first proposed, and two wires in one duct were prohibited, while the best insulation was declared to be none too good for the contained wires in these highly vaunted acid, rat, moisture and lime-proof cure-alls, for cheaply insulated conductor diseases, and so rubber insulation became again in use, but at this junction, after the hard competitive struggle for recognition, aided by the undiscrimina-

ting Underwriters' rules, there were no longer any best insulated wires.

Soon these tubes were discovered to be of little protection to the contained wires from the hammer, nails and saws of the workmen, so another "improvement" was made by wrapping an "armor" of thin metal about the tubes; but still nails, hammers and saws encountered no perceptible difficulties in producing mechanical injury, so another improvement was inaugurated by drawing the tubes through heavy gas piping: thus the cost of installations was further increased and the equipment of buildings with electric lights became more of an expensive luxury, and the "lag" when alternating currents were used came to be considered detrimental.

At this stage these ideas became so serious that some sensible electricians proposed to do away with paper tubes entirely, by placing the insulation where they considered it belonged, around and on the wire directly and to make it of durable high grade quality and then use plain iron pipes for the sole purpose of mechanical protection.

There have been no class of people so stubborn to electrical common sense construction and so readily carried away with foolish and expensive innovations as architects and our friends in the various underwriting departments.

To their methods of protecting themselves against the poorer class of insulations and giving no advantage or protection to manufacturers of high grade materials, we owe mainly the many mistakes, failures and the great expense of electric equipments as compared with gas.

(To be continued.)

#### IS ELECTRIFICATION DUTIABLE?

#### BY HARRY L. TYLER.

From some points of view it is strange that a discussion should arise over the question "Is a current of electricity subject to tariff duty?" At the outset the question itself is baseless: for there is no such thing as a current of electricity. It is, moreover, very likely that few well-informed people think that there is such a thing. The fault is that altogether too many eccentric words have been elbowed into electrical diction. Custom is usually a good thing, but the truth is often better; and in science we should always choose the diction that expresses the truth.

In the contention between the Niagara Falls Power Company and the Ontario Power Company, any one is unfortunate that asserts that 'electricity is a thing that can be measured as accurately as potatoes, wheat, cloth and the like." Electricity is a science—the science that treats of electrification. Electric things are operated with electrification, and not with electricity. It is true that electrification can be measured as accurately as can anything that is measured in degree; but the mentioning of substance, which is always measured in quantity (potatoes, wheat and the like) makes a contrast—not a comparison. Electrification does not involve the addition, the removal nor the transportation of substance. Electrification consists in a conditional change in whatever substance is affected. Electrification is induced--not manufactured.

What is the Ontario Power Company doing? It is electrifying (inducing a condition in) substances that are in the United States. In no sense can the company be accused of either im-

porting or exporting. The real questions are: Should the Ontario Power Company be required to pay tribute that it would not have to pay if its generators were in this country? Should there be a law to require the owner of an electric circuit to pay tribute to whatever country his circuit might extend into, if his generator were not in that country?

There is another matter that likewise owes its confusion to the haphazard use of electrical words—i. e., the so-called "stealing of electricity." Every one with any moral sense knows that the unauthorized dissipation of electric energy is a vice. To make the act a crime, however, we should do more than enact laws; we should be careful of the diction that composes the laws.

When a person has stealthily lighted his house for a season or two at the expense of some electrical station owner, the owner can not get sentence passed upon the offender. Even the recent State laws are so weak that they are useless in that they require the victim to prove a theft-which he can never do. History shows that in the legal trial of such cases there is always a good deal of testimony and no evidence. It would be very easy to convict an offender if the laws were worded to conform to the facts, thus making it a crime to affect the energy of an electric circuit by surreptitiously placing substances in inductive juxtaposition thereto or in contact therewith. or by making use of the electrification of substances so placed.

#### Utilization of Electricity in Mining.

The introduction of electricity into mining, as a power, has become an important factor in Cripple Creek. Two central plants are now in successful operation, running hoisters, compressors, mills, samplers, lights and pumps, and a third immense plant is in process of construction. The time seems not far distant when the mines of the district will be entirely operated by electric power.

The Colorado Electric Power Company has had its plant in Canon City in operation for eighteen months. Power generated forty miles away is transmitted to Cripple Creek and distributed from two sub-stations to various clusters of mines. For the past year this company has supplied power without a moment's suspension. At present its entire 2,000 horse power is utilized by the seventy hoists, the Economic mill in Eclipse gulch, the Taylor & Brunton, Rio Grande and Cripple Creek samplers and other enterprises it is supplying. The company has orders for power for fully forty additional hoists, and as soon as possible the plant at Canon City will be enlarged to double its present capacity. This company was the pioneer in supplying electrical power and its success has attracted the attention of the electrical world. The adaptability of electricity as a motive power in mining has been thoroughly proven. No electrical drill entirely satisfactory has yet come into use in Cripple Creek, but the Lillie and Tornado mines are adapting electricity to their air compressors and so operating drills with the power on an economical basis. The oddest use of electricity in mines is in pumping, the Portland now operating a small pump in that way. The plant at Canon City represents an investment of \$350,000, and the company has found its venture highly profitable.

In August the La Belle Mill, Power & Water Company was put in operation. It is declared



by experts to be the most complete electric plant in the United States, and in addition to generating 2,000 horse power in electricity for distributing to various users, expends 1,000 horse power in operating air compressors, which send compressed air for drills to the Victor, Golden Cycle and other mines in the Moffat-Smith combination, and also to other compan-The plant entailed an investment of \$400,000. Electric power is distributed to the District Electric Railway for the running of cars, to the National sampler for crushers, and to the Gold Belt Electric Company, a branch organization which recently absorbed the Fremont Electric and Victor Lighting Companies for supplying lights to the cities of Cripple Creek, Victor, Anaconda and various mines and towns within the district. This plant and its companies were recently merged into the Denver & Southwestern Company. The plant will be enlarged during the coming year.

Manufacturers of mining machinery and supplies have for years found the Cripple Creek district their, best patron. The past year was no exception. A careful estimate of the expenditure for new mine, mill and sampler plants during 1899 shows fully \$1,500,000 added to the permanent equipment of the camp, and the demand increasing rather than diminishing as the years go by. There is not another mining camp in America that requires as many hoisting plants as Cripple Creek, there being fully 250 in constant operation. In the line of candles, giant powder, fuse, caps, steel and hammers, the camp consumes them by the trainload.

## THE APPLICATION OF THE TELEPHONE TO MINES\*

In almost every department of commercial and public use the telephone and various adaptations of its principal features have become a necessity, and yet its utility seems to have been entirely neglected so far as mining in Victoria is concerned, except in a few isolated cases. This is the more surprising, as a reliable means of speedy communication between surface and underground workings would be of vast benefit, a saving of time, which means money, and possibly on occasion a saving of life, which means more than both. But hitherto some weighty objections have barred the way. In other words, there have been some "lions in the path," representing severe conditions under which practical operations seemed almost prohibited. About two years ago the writer began a series of inquiries at Bendigo and elsewhere, and the following is a summary of the principal "lions": First and foremost, a system had to be found that, while allowing for all possible requirements, would yet be simple, and not liable to go wrong mysteriously, for any telephone system for use in a mine cannot afford a trained expert waiting around to cure electrical faults: and finally, if this ideal system proved costly to erect or maintain, then it was no good anyhow. Eventually a scheme was arrived at which promised to comply with most of the conditions, one wire only to be used, properly insulated, any number of levels to be able to "get in" to this one wire and raise surface at all times. Here "lion" No. 1 arose, thus-Each of these telephones at levels would, under usual practice, require a battery to work it; but when you come to put batteries underground in a damp and variable atmosphere, sometimes above 80 or 90 deg., it is soon found that their output will fall off or vary from time to time. Every such variation passing into a telephone while in use will set up business on its own account, to the confusion of audible speech. So at the very outset something entirely novel in the way of "circuit" or internal arrangement of apparatus within each instrument had to be performed. That such was eventually found was owing to a host of brilliant failures which preceded the final success; and yet, looking backward, a slow progression was visible in most of these apparent retrogressions.

There is evidently a law of evolution which controls invention, like most other things. However, all batteries could now be placed on surface, and "lion No. 1" had vanished. But there are few mines where mineral water is absent, and woe betide any copper conductor it touches. Corrosion, helped by electrolytic action, is the certain result to a variety of kinds of insulated wire, suspended for weeks together, in some of the worst mineral water, that could be found. They were tested before going down. and tested when they came up, with the result that a lead-covered rubber insulated wire came out best of all. It was entirely unaffected and the conductor problem was solved. Then the worst "lion" of the lot appeared. A position had to be determined on for placing the main telephone at surface, and the only proper place for it is close alongside the winding engines, within easy reach of the driver; and that is just the place where a telephone seemed impossible to operate. The din of stampers, a few yards away, perhaps, of air-compressors close alongside, together with the winding clank of gears and pump connections, seemed to render any kind of hearing a delusion.

After repeated trials it was found that the receivers, one at each ear, only required to be fitted with rubber cones or short funnels, and the surrounding noise became a distinct rumble. The remaining difficulties were soon overcome; an easy method for attaching the wire to sides of shaft was devised; porcelain insulators fixed with specially coated screens, the flexible conductor taking a half turn around each. For joining ends of leads electric light fittings were found to be just the thing-small porcelain boxes with screwed caps, technically known as "cut-outs," Under ordinary conditions a rate of erection of 600 feet per 8 hours was found possible with two men, one to carry the end past obstacles, the other to carefully lower at the reel. And it must be remembered that this successful result was arrived at largely owing to the interest taken and assistance given by Mr. W. B. Gray, of Maldon (V.), who allowed the use of apparatus at the South German mine, at Maldon, where, with the generous help of the mining manager and staff, the final experiments took place. This famous mine has now the honor of being the first to use the system for deep levels, a length of 1,600 feet having been in successful operation for some time. There remained one result which was not even hoped for, viz., a means of speaking from a hand telephone in each cage in case of anything going wrong with the haulage. This meant using the wire rope and knocker line as emergency conductors, and is only possible by a system where all batteries are concentrated at end of circuit, as in this case. For this purpose a switch is employed in enginehouse, by means of which the current can be diverted from the usual conductor and sent along the knocker lines. Then, a telephone attached to the wire rope at one side and temporarily connected to the signal line on the other becomes capable of being used, in spite of the general leakage along the sides of the shaft from the uninsulated knocker lines.

As this telephone system for mining is entirely novel, and a distinct advance on anything hitherto attempted, patent rights have been secured for the essential features, and it is in the hands of the India-Rubber, Gutta-Percha and Telegraph Works Company, Melbourne.

## MOTOR VEHICLES FOR HEAVY TRAFFIC.

The report of the judges on the recent trials at Liverpool, England, of motor vehicles for heavy traffic has been submitted to a meeting of the Liverpool Self-Propelled Traffic Association. The document, says an English contemporary, is one of exceptional interest, the trials with which it deals marking a distinct advance in this important movement. The judges, all of them engineers of eminence who have given special attention to the subject, report that the vehicles competing were generally superior to those submitted for trial last year, and had arrived at such degrees of mechanical excellence and efficiency that their use in practical trade operations would be attended with success and economy as compared with horse traction. The effective speed on set pavements was double that of horse drawn lorries carrying equal loads, and the difficulties at present experienced in ascending or descending hills were overcome by the motor wagon. The vehicles were capable of competing advantageously for the transport of loads varying from four to six and a half tons, over distances up to 40 miles, over which distance a working day of 12 hours should suffice for collection, transport and delivery. The general control, starting, steering and stopping of the vehicles, when working on the road and amongst traffic, was superior to the best types of horse-drawn vehicles. Four tons of load, carried on the legal tare of three tons at the legal speed of five miles an hour, was the maximum performance that had so far been obtained satisfactorily by a four-wheeled vehicle, but a load of seven tons could be carried if a single trailer was used. The difficulties imposed by meeting the limit of three tons tare under the Locomotives on Highways Act, 1896, were again serious drawbacks to ideal construction The judges were unanimously of opinion that the raising of the limit of tare to four tons was eminently desirable in the interests of proper economy and efficiency, and they were further of opinion that such an increase in the tare weight was for the safety of the public and in their interests. The judges hold strong views that the requirements of trade in large manufacturing and distributing centers cannot be met with the load limit of four tons, which these and the previous trials clearly indicated as the working maximum. To satisfy such requirements fully it was necessary to carry from six to ten tons on one It was clear to them that the heavy motor wagon industry could not in this country attain its legitimate proportions until the esent restrictions were modified, so as to enable manufacturers to supply vehicles capable of carrying loads of the same weight and bulk as those now drawn by horses. Self-contained vehicles capable of transporting regularly loads of from six to eight tons at from four miles an hour, and up to ten or twelve tons at reduced speeds, would shortly be available were a four ton tare sanctioned. Gold medals were awarded in two of the classes for the vehicles entered by the Steam Carriage and Wagon Company, Limited, Chiswick, while silver medals were voted to the wagons forwarded by Bayleys, Limited, Newington Causeway, London, and the Lancashire Steam Motor Company, Leyland.

<sup>\*</sup> From the Austra'in Mining Standard.

#### A GERMAN ELECTRICITY WORKS.\*

An electricity supply works has been erected in Bonn, utilizing a 2 x 220 volt three-wire system, with not only an earthed middle wire but a bare middle wire. This station, which has now been running since the middle of February, 1899, was described in detail in the Elektrotechnische Zeitschrift of December 7th. Another somewhat new feature in the distributing system is, that although the station itself is on the borders of the district supplied, a main feeding point has been chosen in a central position of the town, which is fed directly from the station by four heavy cables each of one square inch section, and from this feeding point 13 pairs of feeders radiate out to the actual feeding points on the distributing network.

Dr. Paul Bauer, who is the writer of the article, states that Bonn is the first town in Germany to adopt a 2 x 220 system of any large size, although there are several smaller systems employing 220 volt two-wire systems in that country. Since the erection of the Bonn station was started, the towns of Crefeld and Basle, Switzerland, decided to employ similar systems, and these will shortly be in operation. The expectation that the weight of copper employed would be a quarter of what was necessary on a 2 x 110 volt system was not absolutely fulfilled in practice, although of course there was a great saving. There were two reasons for this. In the first place, increasing the load in this proportion would mean that the current density in the copper would be doubled, and, especially in the case of short feeders, this would result in a current density exceeding what is generally considered permissible. In the second place, some small and lightly loaded distributing mains would, according to this calculation, have sections smaller than would be advisable from practical considerations. These points apply especially to a 2 x 220 volt system with a bare middle wire, as the bare middle wire itself cannot be greatly reduced, on account of possible electrolytic or direct chemical action upon it. Moreover, the earth currents emanating from the adoption of the middle wire would, if a great fall of pressure were allowed on it, cause disturbances to the telephones (which are on the single wire earth-return system in Germany) and cause electrolytic action in other conductors under the streets. In addition, the cost of cable does not increase in proportion to the section of copper, but at a slower rate, and the cost of cable fittings is practically the same for the two pressures. So that, taking all in all, one can reckon that the cost of a 2x 220 volt network amounts to from half to threequarters that of a 2 x 110 volt one for the same supply.

After pointing to the advantage of a 2 x 220 volt system, that the same machines can be employed both for lighting and traction (although of course not from the same 'bus bars if the full pressure is employed for the traction with an earthed return), and the disadvantage in the necessity of having so many arc lamps in series of constant pressure mains, the writer proceeds to describe the generating station, which has some points of interest. The water in Bonn cannot be employed directly in the boilers, on account of its extreme hardness, and has first to be freed of lime and carbonates. For this purpose solutions of caustic soda and quicklime are employed to precipitate the lime and carbonates respectively. The two solu-

tions are kept in separate wrought-iron vessels and they are fed automatically into the water. After this mixing in a special vessel, the filtering takes place in two cylindrical vessels with funnel-shaped bottoms, in which the precipitate collects. The vessel is so constructed that this slime can be conveniently removed from time to time. Thence the water is led to two tanks, from which it flows directly to two feed-pumps beneath. This water-softening and cleaning plant can deal with 2,640 gallons of water per hour. Steam is led to the four-throw Weise and Monski feed pumps (capacity of each 3,170 gallons per hour against a pressure of 147 lbs. per sq. in.) through wrought-iron ring mains with copper bends. The water condensed in the various steam mains is, when clean enough, allowed to flow into the feed tank; and the feed is further heated by leading the exhaust from the feed pumps through the mixing vessel into the open air. A cooling tower is employed for the circulating water of the condenser.

The boilers are two in number, by Messrs. A. Büttner, of Uerdingen, and designed for quick steam raising. Each contains 117 inclined water tubes 3.74 in. in diameter, 0.14 in. thickness, and 16 ft. 5 in. long. Each boiler is fitted with a superheater of 520 sq. ft. heating surface, consisting of a number of thin wroughtiron tubes placed in the path of the furnace gases, and through which the steam from the boiler is led to the mains. This increases the temperature of the steam by 40° to 60° C. Two different systems of "smoke-consuming" stokers have been put in, to enable a comparison to be made between them. One is by Kowitzke, of Berlin, and the other by Fröhlich, of Leipsic. In the former a sufficiency of strongly-heated air is automatically led through a cast-iron fire bridge of peculiar formation and provided with hollow spaces. This supply is regulated automatically by a stop valve controlled by gearing for a certain time after fresh fuel has been added, and in this way perfect combustion is attained. The Fröhlich stoker is briefly an inclined grate, which the fuel reaches through a hopper without the entrance of cold air. The fuel slides down the grate as it gradually burns, and finally falls into the ash-pit through a trap at the end of the grate. Above the grate is a bridge of refractory material in which are air channels, and the glowing walls of this, in conjunction with the air entering through these passages, are said also to effect complete combustion. A convenient arrangement is provided for removing the ashes. Two similar boilers are now being erected in addition to those already working.

Wrought-iron duplicate steam mains with copper bends lead to the engine room, where there are at present two vertical compound engines running condensing at 150 revolutions per minute, and with an average output of 200 hp. and a maximum of 250 hp. each. They are from Messrs. G. Kuhn, of Stuttgart, and their main dimensions are: Horse-power cylinder 18.3 in., L. P. cylinder 27 in., stroke 17.7 in. They have piston valves, and regulate by variation of the cut off in the high-pressure cylinder. The condenser pump is also of Messrs. Kuhn's construction, and is worked from the cross-head. The engines are arranged to work condensing or non-condensing. According to the guarantee, the engines are to develop 200 hp. with steam at a pressure of 132 lbs. per sq. in., using 17.2 lbs. of steam per ihp. per hour, and 17.6 lbs, of steam at the maximum load of 250 hp. A half per cent, speed variation is allowed dur-

ing one revolution. A Swiderski triple expansion engine, rated at 650 hp., is being erected.

The engines are directly connected to the dynamos, which are of the Siemens-Halske internal pole multipolar type, capable of generating 175 kw. each at a pressure of 440 to 550 volts when running at 150 revolutions per minute. A maximum temperature rise of 50° C, is guaranteed, and an efficiency of at least 90 per cent. For the Swiderski machine, a Siemens & Halske dynamo will also be provided.

The battery consists of 200 (E 23) Tudor cells, with a capacity of 540 ampere-hours at the maximum charge or discharge rate of 180 amperes, or a capacity of 700 ampere-hours at 70 amperes discharge. Four hundred amperes may, however, be taken from the battery without injury. The cells are erected in two rooms above one another, and two similar rooms above these are provided for a similar battery which will eventually be put in as a "buffer-battery" for tramway work. Thirty-eight regulating cells are provided at each end of the battery, two to each contact of the regulating switch. A combined set of balancing transformer and boosters is employed in much the same way as is done in a number of modern stations in this

The switchboard is of marble mounted on an iron framework, and is placed at a distance of 5 ft. from the wall on a platform 8 ft. 3 in. above the ground. All the fuses for the machines, battery and feeders are fixed on the wall below the platform, and shut off from the rest of the engine room by an oaken wall with a side door at the end. Here are also meters and switches controlling the pump motors. The back of the main switchboard is also accessible through a door at the end. An innovation is the insertion of bells across the resistances bridging the contacts of the battery regulating switches, so that a bell rings if the switch is left between two contacts. The station pump-motors, and station lighting are arranged so that they can be switched on to either side of the three-wire network, and thus aid in balancing the load.

The arrangement of the feeders has already been referred to. At the central feeding point is a small iron tower, similar in form to the transformer houses so common on the continent, and from here all the feeder circuits are branched off through fuses. Two ammeters are arranged with plugs to fit into contacts on either side of the fuses, so that an ammeter can be cut in and the current through the feeder measured without interrupting the circuit. Pilot wires run from the feeding points to this central switching point, and thence to the station, and there is also telephonic connection to the station, so that testing is greatly facilitated. The distance of the farthest point of the network to the station is about 2.4 miles and the whole length of streets in which cable is laid is 18 miles. At all feeding points and branching or crossing points of the network disconnection boxes are provided, but in making house connections it is unusual to disconnect, it being found that an experienced jointer can do the work while the cables are live. The network is designed for an equivalent of 8,000 16 cp. lamps, on the basis of  $2 \times 50$ volts drop of pressure from station to feeding points and 2 x 3 volts on the distributing network.

All the house connections are made as threewire connections. Up to about 20 lamps the wiring is connected to one side of the threewire network, and the service cables end in a



<sup>\*</sup> From the Electrician, London.

switch fuse which enables either outer to be connected to the wiring, the free pole remaining covered by a protecting cap. Connections of over 20 lamps two separate single-pole fuses are employed, and the circuits of the house wired on two absolutely separate circuits, one on each side of the three-wire system. No fuses or switches are connected on the middle wire. Motors over 2 hp. are connected between the outers.

When supply was started in February there were 350 consumers, and the number now exceeds 400. This is considered a large demand for the first year's working in a town of 40,000 inhabitants. No trouble has been experienced with the new system of distribution.

#### THE TELEPANTOGRAPH.

The "telepantograph," the invention of R. Greville-Williams, may be described as an electrical instrument by means of which a drawing, letter, photograph, shorthand, diagram or other graphic matter can be automatireceiving instrument will print two copies or more at the same time; and thus undisputed records of all messages are obtained and can be used for future reference. Should a large number of copies of the reproduction be required, the receiver will engrave it directly on copper, zinc, etc., instead of writing it on paper, and in this way thousands of copies can be printed from the plate. In this case the marker or the receiver is replaced by a graving tool and the paper by a sheet of metal.

The letter or drawing to be transmitted is written or drawn on a sheet with a specially prepared ink and as soon as this ink is dry the instrument may be started. When the message arrives at the receiving station it is complete. The ink made use of is a compound of gelatine and a bichromate and is covered by patents taken out several years ago in Great Britain, Germany, France, Russia, Austria and the United States.

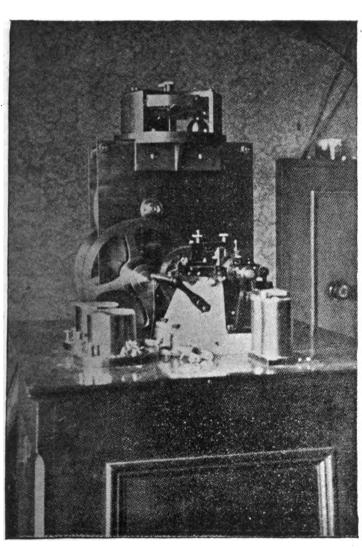
A decided advantage of the telepantograph over some of the other systems of transmitting pictures, recently brought out, is that the pro-

sages. The cost of news can be greatly reduced if telegraphing in shorthand be resorted to, for a message written on the metal sheet in shorthand is as easily transmitted as one in which words are used.3

Commenting on the field of usefulness of Mr. Greville-Williams' invention, the paper quoted above says:

"That the telepantograph will prove of great value in many different ways cannot be doubted. We have space to hint at only a few of them. The special correspondent of a newspaper will be able by its aid to send to the printing office sketches, diagrams, photographs, etc., of events happening in all parts of the world, for wherever the telegraph wire goes, there the telepantograph will find a sphere of action.

"Pictures of some great battle in Egypt, China, or any part of America could then be sent by war artists, and the reader would find in his evening paper sketches of a battle fought but a few hours before. All this seems to point to the fact that the newspaper of the



TELEPANTOGRAPH RECEIVER.

cally telegraphed to any distance to which an ordinary telegram can be sent through the medium of one wire. tions and consequently no loss of time.

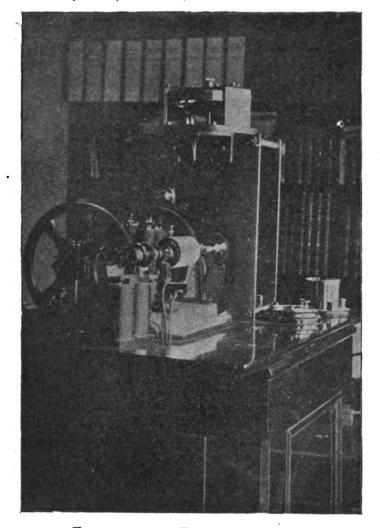
When you desire to send a message all you have to do is to write it, draw it, or have it photographed on to a thin metal sheet, and place this in the transmitter. You then simply turn a switch, and the inscription, whatever it may be-drawing, photograph or letter-is automatically recorded by the receiver at its destination on paper, wood, metal, etc., as desired.

If the message is to be received on paper, the

cess invented by R. Greville-Williams is a mechanical one, requiring no chemical manipula-

The West-End, a London publication refers to the telepantograph as follows:

We may imagine that in the future each postoffice will contain a telepantograph, which would be placed beside the ordinary telegraph instrument and switched on to the same wire used for ordinary telegraphing. On the duplex system now in use, the two machines could be worked on the one wire at the same time without in any way affecting their respective mes-



TELEPANTOGRAPH TRANSMITTER.

future will be much more profusely illustrated than is the journal of to-day; in our daily paper we shall then find photographs, sketches and pictures illustrating events that took place in all the four quarters of the globe but the day before.

"To the detective and police force the telepantograph will prove a serviceable ally, for in the event of a convict being 'required,' his counterfeit presentment could be telegraphed all over the country so that however quickly he might arrive at a port with the intention of taking ship to some foreign part, his picture



would be there before him and he would be at once recognized and captured."

As regards the practicability of this method of transmitting pictures and messages it is stated that many telegraphic experts in Eng-



PICTURE RECEIVED ON THE TELEPANTOGRAPH

land are of the opinion that with the telepantograph practical results have been produced never before obtained.

#### USE OF ELECTRICITY IN SOUTHERN IN-DUSTRIES.\*

BY SAMUEL J. SMITH, Charlotte, N. C.

One of the best things about the progress of electricity in the South is the demand for a higher standard of electrical apparatus, as the better grades are being more commonly required and the best quality of workmanship is wanted.

This is due to the fact that much costly experience has been gained in past years, by users of the cheaper and generally high speed dynamos, and inferior design in wiring and engineering construction.

The call now is for electrical apparatus of the higher grades, and wiring put in of not only good electrical design, but also of good workmanship, and closer observance of insurance rules.

Slow speed apparatus is more largely in demand, and there is some tendency to direct connected, because such sets are easier handled, saving wear and annoyance of belts, economizing floor space and giving a somewhat higher power efficiency.

Most of the dynamos of fair size and larger are now run by special engines, as this not only insures better regulation and so saving of lamps, but also provides light after the main engine has shut down.

The cotton mill is largely responsible for the higher quality of plants, as many of the mills run at night, and those of the day runs require light during a number of months, and it is absolutely necessary to have the most perfect of plants, as a shut-down of all, or even a part, of the lighting system means much loss in production and consequently money loss.

The mills during the past year, and especially the latter part, have kept the electrical men busy, putting in more modern machinery in place of the old, installing plants in new mills and correcting the wiring in old mills.

Perhaps one advance worthy of note in cotton mill lighting is the use of the arc lamp, i.e., the enclosed arc, which consists, in addition to the usual outer globe, of an inner globe or bulb in which burn the positive and negative carbons, and a life of 100 to 150 hours is thus gained for one trimming of the lamp.

This long burning quality has made the arc lamp practicable, and because of its light being nearest sunlight, it is especially useful for colored goods. The better light gives less "seconds," and poor light, as one superintendent remarked, "gives no goods at all."

There is also a more general call for motors for pumping water, or running any machinery removed from the shafting or steam lines - and this is simply in the line of greater economy and perfection.

A new thing projected this year and which will be watched with interest, is the electrically-driven mill, i.e., in which the electricity is generated from steam and then transmitted to motors at various points in the mill buildings.

There is good reason to believe that such an equipment will give not only better regulation and more uniform speed, but what is important to the mill man—an increased output with the same machinery and labor.

The tendency in plants for light and power seems to be the use of larger units, because of higher economy and being easier handled—a greater use of improvements on the steam side and more practice of system in the management of such plants.

Power circuits are being found profitable, because of the many uses for the electric motor, and the consequent upbuilding of many small industries.

Many of our railway and light plants have been consolidated and the combination gives better service to the town in which they are located, and is also more profitable to the stockholders.

The work of the past year makes it evident that there is a good investment in a light or power plant, or both, when such a plant is laid out with proper engineering design and reference to the service to be given.

Perhaps the electrical development that attracts most attention is the transmission of electricity from water power. There are a number of powers already developed in the South, now building and projected and space forbids a description of the more important, especially as these have been already described in the 2 adesman.

The transmission of electricity is limited largely by the cost of the transmitting copper lines, and the maintenance of such lines, and as high as sixty and seventy miles are in use; but for practicable commercial-use about twelve to fifteen miles is the limit, though under especially favorable circumstances twenty or even twenty-five miles might be covered.

The use of large powers is not necessarily the most profitable, as many small ones exist all over the South that could be easily and cheaply developed, and furnish power for a factory, cotton mill or other industry, and which in turn will furnish employment to the neighboring population, and this is the best possible development of a country.

There are situations where an electric railway could be operated by such power, and thus connect some isolated town or mill to a main line of railroad. When one thinks of the much hauling through winter mud, in such situations, it seems especially profitable.

An electric railway can haul freight, express and passengers cheaply under such conditions, for the power is cheap, the equipment of rolling stock is moderate in expense, and rails can be laid and routes chosen not practicable for a steam railway.

For the above reasons also an electric railway connecting good-sized towns is better than steam service, even if the power is generated by steam; for such a plant can be operated in connection with local power and lighting plants.

The most expensive part of a transmission plant is generally the water or hydraulic development, and this cost varies per horse-power very much, while the cost of the electrical part per horse power is more constant, varying only by total power.

In short, it may be said that whenever the water part can be done at a moderate cost, then by all means develop it.

In conclusion, 1899 has been a very good year for the use and practice of electricity, and much credit is due to electrical men of the South in making a higher standard of work, and it can be well said that good, representative firms can be found in several sections of the South, who can build and install up-to-date plants, based on experience and engineering training.

In the coming year there are excellent opportunities for the use of electricity in an ever widening field, and greater encouragement than ever will be given to the man who is thorough in his work and "building for the future."

If 1900 will continue the prosperity of the last of 1899, then such men will be well rewarded; and good electrical men require a training and experience that merits reward

#### American Electrical Apparatus in the Orient.

Three years ago the electrical apparatus furnished in the Orient was almost exclusively of German or English manufacture. During the last year, however, the greatest portion of the electrical apparatus furnished in the Orient has been of American manufacture, this being the case regardless of the higher prices of American machinery, the orders being placed with the American firms on account of the superiority of their product.

The Commercial Electric Company of Indianapolis, Ind., has recently furnished an electric lighting plant for the illumination of the river front of the city of Shanghai, the order being placed directly by the Chinese Government.

This company has also completed the installation of a complete lighting plant for the Japanese Government for the penitentiary at Yokohama.

Another recent installation is the complete electrical equipment of the new Government ice and refrigerator plant in the city of Manila.

## The New York Electrical Society-201st Meeting.

By courtesy of the New York & New Jersey Telephone Company, the Society will visit the company's main exchange, at 81 Willoughby street, Brooklyn, on Wednesday, January 17, at 8:30 P.M. Mr. F. O. Runyon, the engineer of the company, will deliver an address on "The Common Battery System," and describe the features of interest in the exchange. The visitors will assemble on the fifth floor. After Mr.



<sup>\*</sup>From the Chattanooga Teadesman.

Runyon's address they will be escorted in groups over the building.

The exchange is three blocks from the City Hall. Passengers on Fulton street or Myrtle avenue cars will get off at Lawrence street and walk one block to Willoughby street.

#### LONDON NOTES.

(From our London Correspondent.)

#### Standardizing Copper Conductors.

Not long since a committee was formed, consisting of representatives of the Institution of Electrical Engineers, the General Postoffice, and the principal manufacturers of rubberinsulated cables to consider the question of including copper conductors among the standardized engineering products. The committee has now issued its report. It says among other things that "the advantages of standardizing are being largely advocated for almost all classes of engineering products, but copper conductors have hitherto not been included in the list, as everyone has assumed that they were already standardized, and that Matthiessen had settled the resistance and temperature coefficient of copper in his researches nearly 40 years ago." This assumption, says the report, is far from being true, and the catálogues of various electrical cable makers, as published before 1899, show considerable discrepancies in the resistance and weight of nominally the same cables, while the Postoffice issued a specification differing from all others. To remedy this confusion the committee was appointed. It had as its chairman Sir W. H. Preece, K.C.B., F.R.S., with Messrs. Gavey and Hartnell, representing the General Postoffice; Prof. Ayrton and Messrs, Mordey and Taylor for the Institution of Electrical Engineers, and a number of cable manufacturers' representatives. Mr. A. H. Howard was secretary. The committee reports:

- 1. Resolved, That Matthiessen's standard of .153858 standard ohms resistance for a wire 1 meter long, weighing 1 gramme at 60° F., be taken as the standard for hard drawn high conductivity commercial copper.
- 2. Hard drawn copper to be defined as that which will not elongate more than 1 per cent, without fracture.
- 3. Resolved, That Matthiessen's standard of .150822 standard ohms resistance for a wire 1 meter long, weighing 1 gramme at 60 F., be taken as the standard for annealed high conductivity commercial copper.
- 4. Copper to be taken as weighing 555 lbs, per cubic foot at 60° F., which will give a specific gravity of 8,912.
- 5. Resolved, That Messrs. Clarke, Forde & Taylor's temperature coefficient, as published in their pamphlet dated February 20, 1899, be adopted, and that the average coefficient of .00238 per degree F. be adopted for commercial purposes.
- 6. Resolved, That the resistance and weight of conductors be calculated from the actual length of the wires.
- 7, Resolved, That a lay of 20 times the pitch diameter be taken as the standard for the calculation of tables.
- 8. Resolved, That 2 per cent, variation of resistance or weight be allowed in the conductors.
- 9. Resolved, That an allowance of 1 per cent. increased resistance as calculated from the diameter, be allowed on all tinned copper between Nos. 22 and 12 guage inclusive.

NOTE TO FIRST AND THIRD.

The figures inserted have been calculated for

60° F. from the figures .1469 per meter gramme for hard drawn and .1440 for annealed at 32° F. by Matthiessen's formula.

 $\frac{1 - .00215006 (t - 32) + .00000278 (t - 32)^2}{1 - .00000278 (t - 32)^2}$ 

From the above data formulæ are obtained giving the standards, but a variation of 2 per cent, in resistance or weight is allowed for losses in manufacture. The figures have been adopted by all the parties represented on the committee and the hope is expressed that they may become the universal standard for Great Britain. The Postoffice specifications are to be issued in accordance with the report and the same figures will be included in all manufacturers' catalogues, so that there is little doubt about the adoption of these standards in Great Britain.

#### Funeral of Mr. and Mrs. S Dana Greene.

The funeral services of Mr, and Mrs, S. Dana Greene, who were drowned on the evening of January 8, were held in Schenectady last Thursday. They were attended by scores of distinguished persons, including Gov. Roosevelt and his staff and Naval and National Guard officers. A special train from New York brought a detachment of the Naval Reserves and a number of prominent electrical engineers.

The bodies of Mr. and Mrs. Greene were viewed by friends in the parlor of their late home during the morning. They were in plain coffins covered with black broadcloth. In the right hand of the husband was a small picture of the wife, which Mr. Greene had carried for several years. The coffins were surrounded with flowers. A short service of prayer was conducted at the home at half past 12 o'clock, and then the bodies were escorted to St. George's Episcopal Church by Company F. Second Regiment, and a detachment of the First Naval Battalion, under Lieutenant Andrews. The Naval Reserve detachment served under Lieutenant Greene on the Yankee during the Spanish war. The services at St. George's were conducted by the Rev. Dr. J. Philip B. Pendleton and Bishop Doane, of Albany.

The pallbearers were Captain J. W. Miller, commander of the Naval Militia: Charles A. Coffin, president of the General Electric Company; Joseph P. Ord. W. L. R. Emmet. Hinsdall Parsons, Howard C. Levis, R. S. Sloan and Douglass Campbell, of New York; James Refield, of Utica: the Rev. J. Russell Stevenson, of Schenectady; C. Whitney Tillinghast, of Troy, and Arthur Clark, of Batavia.

Afterward the bodies were placed on a train bound to Bristol, R. I., where the interment took place.

The business houses of the city of Schenectady were closed during the funeral hours, and the streets through which the procession passed were jammed with spectators.

## Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended January 13:

Antwerp, 80 cases, \$6,232; Barcelona, 65 cases, \$2,797; Bremen, 210 cases, \$3,162; British East Indies, 2 cases, \$118; British Possessions in Africa, 52 cases, \$4,080; British West Indies, 11 cases, \$269; Charleroi, 1 case, \$40; Chili, 13

cases, \$29; Cuba, 228 cases, \$1,229; Dutch West Indies, 1 case, \$12; Ecuador, 1 case, \$17; Glasgow, 57 cases, \$3,967; Hamburg, 109 cases, \$9,410; Havre, 733 cases, \$76,496; Hong Kong, 1 case, \$8; Japan, 44 cases, \$4,209; Mexico, 65 cases, \$2,844; Peru, 13 cases, \$340; Philippines, 16 cases, \$5,127; Porto Rico, 7 cases, 97; Siam, 56 cases, \$893; Southampton, 20 cases, \$950; Stockholm, 1 case, \$120; U. S. Colombia, 90 cases, \$2,566.

#### BIG INCREASE'IN BUSINESS.

## The Wagner Electric Manufacturing Co. Re-elects Its Old Officers and Declares an 8 Per Cent. Dividend.

The annual meeting of the Wagner Electric Manufacturing Company, whose general offices and factory are at 2017-2023 Locust street, St. Louis, Mo., occurred January 8th. The old board of directors, as well as officers, were reelected as follows:

S. M. Dodd, president; James Campbell, vicepresident; S. B. Pike, secretary and general manager; W. A. Layman, treasurer and assistant general manager; Ferd Schwedtmann, general superintendent; E. H. Abadie, manager sales department. Directors; S. M. Dodd, James Campbell, James W. Bell, J. C. Van Blarcom, S. B. Pike, Ferd Schwedtmann and H. A. Wagner.

The reports of the officers there represented showed an increase in the company's business during 1899 as compared with 1898 of 68.5 per cent. By vote of the board a dividend of 8 per cent., payable March 10, was declared.

During the year there have been many rumors current to the effect that the majority of the stock holdings of the Wagner Company had been disposed of to some of its Eastern competitors and that the business was now fully under control of these competitors. All these rumors have been absolutely without foundation. The stock is held entirely by St. Louis parties and the officers and directors of the company are all representative St. Louis business men. The year just closed has been one of the most successful in the history of the company, being specially marked by a large number of important contracts calling for a high grade of engineering work.

### TESLA IS NOT SICK

#### And He Says He is Going to Telegraph from New York to Paris Without Wires.

Denver, Col., Jan. 14.—Nikola Tesla proposes to telegraph from New York to Paris without wires. He arrived yesterday from Colorado Springs, where he has been working secretly, and announced that he had perfected a system of wireless telegraphy vastly superior to that of Marconi. He left for New York last night.

Said Mr. Tesla: "I didn't come to Colorado for my health, but to learn the effect of dry air and high altitude upon the machine I have perfected. The benefits of my machine during a sea fight cannot be estimated. It will aid in doing deadly work.

"The beauty of my machine is that it can transmit power over several thousands of miles without wires. Now the Marconi system is useless at distances of more than one hundred miles. Any operator can read a message in transit by the Marconi system. It is impossible to do this with my machine. I expect to send messages to Paris during the Fair."



#### LEGAL NOTES.

A jury, before Justice Geigerich in the Supreme Court of New York, gave John Jacob Goetz a verdict for \$8,000 and costs against the Metropolitan Street Railway Company. Goetz was employed by the company and was injured by an explosion of compressed air at the Lenox avenue depot.

Judge Andrews has decided in favor of Charles Cohen, the Watertown, N. Y., real estate man. The Thomson-Houston International Electric Company must pay him \$8,000 and the costs of his suit. Mr. Cohen went to South Africa in 1889 as the representative of the Thomson-Houston Company, for the purpose of putting in electric street railways, lighting and mining plants. He returned in 1894 and claimed that the company had violated its contract with him by withdrawing his agency after he had worked up a large amount of business for them and had then gone on and closed up, the business themselves. reaping the fruits of his labors and refusing to allow him any compensation. He commenced suit against the company and the trial came off in Watertown in October, 1898. The jury passed upon the contract only, and the computation of the amount due was referred to W. S. Andrews. The decision allows the plaintiff damages in the sum of \$14,000, subject, however, to a counter claim by the defendants of about \$6,000.

## CANADIAN NOTES.

(From our Ottawa Correspondent,)

Mr. Howard C. Symmes, a New York electrician, has joined at Guelph, Ont., the second Canadian contingent for the war in South Africa.

The receipts of the Toronto Electric Street Railway increased from \$1,187,662 in 1898, to \$1,315,049 for last year, a gain of \$127,387. The average daily receipts increased \$349. For the month of December last the receipts amounted to nearly \$120,000 as against \$84,000 in December, 1896.

Mr. Raymond F. Prefontaine, and a number of associates will apply to the Quebec Legislature for an act to incorporate themselves as the Labrador Electric light and Power Co., to acquire and develop water power on the Murray Bay River, and to build electric railways in the counties of Charlevoix, Chicoutimi and

Messsrs. R. and W. Conroy, of Deschesnes, Que., have contracted with E. B. Eddy, of Ottawa, to deliver 2,000 electrical horse-power at the Eddy mills at Hull. Que. The contract is for a period of ten years renewable afterwards for a further time if desired. The price per horse power is \$15, making a \$30,000 yearly contract. The Conroy Bros. will put up the necessary power-house and other buildings at Deschesnes, and Mr. Eddy will use the power supplied for running his pulp mills and his other factories, at which the power was to be delivered.

The Cataract Power Company of Hamilton, Ont., is considering the extension of the radial railway system of that city to Oakville. It is also probable that the Toronto Electric Railway Company will extend its road to Oakville. thus completing an electric line between Hamilton and Toronto.

The Bell Telephone Company has just completed and opened for business a new heavy long-distance copper metallic circuit line be-

tween Ottawa, Carleton Place, Smith's Falls and Brockville, in the Province of Ontario. Work on this line was begun last May at Ottawa, and was expected to be completed in October, 1899, but owing to the quantity of rock encountered on the road, the work has been delayed a month. The company used a portable steam rock drill to drill the holes before blasting, and about 10,000 lbs. of dynamite were employed. The completion of the line required upwards of 3,500 poles, 4,000 cross-arms, and 75,000 lbs, of copper wire. This line gives Ottawa a most direct and perfect long-distance service with Buffalo, N. Y., and other western points, and a material reduction has been made in the rates to such places, as formerly business had to be carried on via Montreal to reach them. Ottawa has now direct connection with Utica. Watertown, Ogdensburg and other central New York points by telephone.

#### PERSONAL MENTION.

Mr. E. P. Sanford has been appointed manager of the Montelair (N. J.) Electric Light & Power Company.

Mr. Samuel Wilkinson has been selected city electrician for the new municipal lighting plant at Northville, Mich.

Mr. William K. McAlister, superintendent of the West Jersey & Seashore trolley line at Atlantic City, died last week at his home in that city

Mr. Jacob C. Rogers, president of the Edison Electric Illuminating Company of Boston, died recently at his home, 231 Commonwealth avenue.

Mr. George M. Kummerlein, who has been superintendent of transportation for the Milwaukee Electric Railway & Light Company, has been appointed superintendent of the company's lines in Racine, Wis.

Mr. Anthony N. Brady, formerly head of the New Amsterdam Gas Company of this city, was elected president of the New York Gas & Electric Light, Heat & Power Company last week.

Mr. W. F. White, formerly general manager of the Omaha Electric Light Company, has succeeded Mr John I. Beggs, who for six years held the office of general manager of the Cincinnati Edison Electric Light Company. Mr. Beggs will fill a similar position with the Milwaukee Electric Railway & Light Company.

## INCORPORATIONS.

The Eaton Rapids Electric Company, Eaton Rapids, Mich. Capital stock, \$10,000.

The San Francisco Electric Light & Power Company, San Francisco, Cal. Capital stock, \$1,000,000. Incorporators: W. Angus, W. H. Crocker and W. F. Pierce.

The Emerson Electric Light Company, Grand Encampment, Wyo. Capital stock, \$60,000. Incorporators: Chatterton, H. A. Frambach and Willis George Emerson, all

The Bellefontaine, Kenton & Lima Railroad Company, -to operate an electric road. Capital stock, \$100,-000. W. N. Miller, F. B. Williams and R. Dunlap are interested.

The Alabama Electric Light & Power Company, Opelika, Ala. Capital stock, \$50,000. Incorporators: H. S. Parsons, T. S. Parsons, H. C. Davidson, J. W. Parsons and J. S. Pou, all of Montgomery.

The Clarendon Electric Light & Ice Company, Clarendon, Ark. Capital stock, \$10,000. J. S. Thomas president, M. J. Manning vice-president, Ike Bondi secretary and treasurer, W. M. Graham business manager.

The Consolidated Railway, Electric Light & Equipment Company, Trenton, N. J.-to make use of electric light and power, also to manufacture gas. Capital stock, \$16,000,000, Incorporators: William W. White, New York City; Frank C. Rowley, Brooklyn, and Walter C. Butler, West Orange.

The Russell Electric Mallet Company of Frederick County, Md.-to manufacture an electric mallet to be used by dentists in driving gold fillings. Capital stock, \$10,000. Incorporators: Percy Russell, Isaac S. Russell, Louis O. Willis. Aggie R. Russell and Anna Mary Willis, all of whom are residents of New Market.

The Victor Euclasure Company, Saco. Me.—for the purpose of manufacturing and dealing in devices to produce light, heat or power from electricity. Capital stock, \$10,000. President, S. A. Bemis of Philadelphia, Pa; treasurer, Chas. F. Munder of Springfield, Mass,

The Stanley Electrical Manufacturing Company, Trenton, N. J. to make and deal in dynamos, etc. Capital stock. \$2,000,000, Incorporators: Frank O. Briggs, William H.

Gandy, Duncan Anderson, William Anderson, John Janeway, L. H. Taylor and William Taylor, all connected with the John A. Roebling Wire Mill.

The National Electrical Appliance Company, New York City-to make electrical and chemical engines. Capital stock, \$50,000.

The New York & Nassau County Railroad Company. Long Island City, N. Y.—to build and operate an electric street railroad. Capital stock, \$150,000. Directors: Daniel Noble, Daniel Callahan, Matthew J. Smith, William L. Woodill, Long Island City; Joseph Bermel, Middle Village; Frederick Bowley, Astoria; Joseph Meycrose, Evergreens; Edward J. McKeever, Brooklyn; Henry P. Keith, Hempstead.

#### ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 802 and 804 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City. N. Y., or 639 F street, N. W., Washington, D. C.

Copies of any patent published can be furnished upon paynent of ten cents. When ordering give name, date and title of invention wanted.]

#### LETTERS PATENT ISSUED JANUARY 9, 1900.

ELECTRIC RAILWAYS AND APPLIANCES. 640,810. Trolley-Wheel. Green B. Raum, Jr., New York City. Filed Oct. 5, 1898.

ELECTRIC LIGHTS AND APPLIANCES.

641,196. Electric Lamp. Christopher Van Deventer, New York City. Filed June 3, 1899. 641,221. Lamp Shade. Reinhard W. Pitman, New York City. Filed Aug. 9, 1898.

ELECTRICAL MACHINERY AND APPARATUS.

ELECTRICAL MACHINERY AND APPARATUS,
640,747. Electric Motor. Oliver F. Conklin, Springfield, O.
Filed April 24, 1899.
640,749. Controller-Operating Mechanism. William H. Conrad, Philadelphia, Pa. Filed Nov. 1, 1869.
640,769. Inductor Dynamo-Electric Machine. Henry Geisenhoner, Schenectady, N.Y., assignor to the General Electric Company of New York. Filed Nov. 14, 1898.
641,051. Electrical Measuring Instrument. John F. Stevens,
Philadelphia, Pa. Filed Oct. 4, 1899.
641,051. Combined Rheostat and Attachment Plug. Lattimore D. Carter. Louisville, Ky. Filed Oct. 20, 1899.
641,125. Electric Motor. Henry Leitner, London, England.
Filed May 16, 1899.
641,157. Switch for Electric Motors. Oscar F. Shepard,
Madeira, O. Filed May 19, 1899.
641,161. Earthing Device for Electrical Circuits. Louis J.
Stele, London, England. Filed June 17, 1899.

TELEPHONES AND TELEPHONE APPARATUS.

TELEPHONES AND TELEPHONE APPARATUS.

640.823. Telephone. Randall F. Smith, Chicago, Ill. Filed Feb 16, 1889. 640,988. Telephone System. John R. Blinck and Charles H. West, Jersey City, N. J. Filed May 8, 1859. 641,005. Telephony. Samuel B. Fowler, Tarrytown, N. Y. Filed Jan. 7, 1899.

#### MISCELLANEOUS.

Filed Jan. 7, 1899.

MISCELLANEOUS.

640,753. Device for Indicating Condition of Storage Batteries. Herman F. Cuntz. Hartford. Conm., assignor to the Columbia & Electric Vehicle Company, same place and Jersey City, N. J. Filed Oct. 27, 1899.
640,787. Device for Indicating Condition of Storage Batteries. Hiram P. Maxim. Hartford. Conn., assignor to the Columbia & Electric Vehicle Company, same place and Jersey City, N. J. Filed Oct. 27, 1899.
640,829. Umberground Conduit. Charles H. Sewall, Chicago, Ill. Filed July 5, 1895.
640,829. Umberground Conduit. Charles H. Sewall, Chicago, Ill. Filed July 5, 1895.
640,823. Fire Alarm Signaling Apparatus. Loudoun Campbell. Washington. D. C., assignor of one-half to Robert J. Thomas, Alexandria, Va. Filed March 17, 1889.
640,833. Fire Alarm System and Apparatus. Loudoun Campbell, Washington. D. C., assignor of one-half to Robert J. Thomas, same place. Filed Sept. 26, 1889.
640,882. Photometer. Charles Deshler, New Brunswick, and Edwin J. McAllister, Newark, N. J. Filed June 16, 1888.
640,939. Section Insulator. John S. Schunnaker and Leroy M. Glodell. Hartford, Conn. Filed June 14, 1899.
640,968. Electric Vehicle. Elmer A. Sperry, Cleveland, O., assignor to the Cleveland Machine Serew Company, same place. Filed Aug. 19, 1888.
641,011. Battery. Gustavos Heidel, St. Louis, Mo., assignor to the Globe Electric Company, same place. Filed March 27, 1899.
641,012. Brush for Dynamo-Electric Machines. Gustavos Heidel, St. Louis, Mo., assignor to the Globe Electric Company, same place. Filed March 27, 1899.
641,012. Brush for Dynamo-Electric Machines. Gustavos Heidel, St. Louis, Mo., assignor to the Globe Electric Company, same place. Filed March 27, 1899.
641,012. Brush for Dynamo-Electric Machines. Gustavos Heidel, St. Louis, Mo., assignor to the Globe Electric Company, same place. Filed March 27, 1899.
641,012. Brush for Dynamo-Electric Machines. Gustavos Heidel, St. Louis, Mo., assignor to the Globe Electric Company, same place. Filed March 27, 1899.
641,012. Brush for Dynamo-El

Jan. 20, 1897. Divided and this application filed Aug. 15, 1899.
641.214. Thermo Electrical Building Bricks or Blocks. Joseph Matthias. Stuttgart, Germany. Filed Dec. 13, 1898.
641.220. Apparatus for Magnetically Separating Ores. Clarence Q. Payne. Stamford, Conn. Filed Jan. 20, 1897.
641.224. Electric Street-Indicator. Joseph Y. Porter. Detroit. Mich., assignor to James W. Morrison, same place, Filed Dec. 17, 1896.



## GENERAL NEWS.

What is Going On in the Electrical World.

#### LIGHTING.

Anderson, Ind.—The electric light plant owned by the city will be greatly cularged.

Baltimore, Mi.—Mayor Hayes has appointed Prof. Jacob H. Hollander, of the Johns Hopkins University; Mr. Edwin G. Baetjer, attorney-at-law; Mr. Charles E. Phelps, Jr., chief engineer of the municipal electrical subway commission, to inquire into the fessibility, practicability and expediency of establishing a municipal electric lighting plant.

Carthage, N. Y.—A New York electric light company has been making inquiries and doing some corresponding in regard to the advisability of locating a plant in this place.

Chelsea, Is.—There is a movement on foot here for an electric light plant.

Columbus, Ga.—This city is considering the advisability of erecting its own electric lighting plant.

Dayton, O.—Bids will be received by L. Traxler for the erection of a 6) horse pow r electric light plant. Address L. Traxler, corner Main and Fifth streets.

De Smet, S. D.—The citizens of this place are agitating the question of building an electric light plant. H. W. Mason is interested.

Elbow Lake, Minn.—The subject of putting in an electric light plant to light the city is being talked of. The question will probably be submitted to the people.

Elkader, Ia.—Messrs. Schmidt Bros. & Co. will ask the town council to submit to a vote of the people the question of granting to them a 20 years' franchise to put in an electric light plant.

Fredericksburg, Va.—This city will issue \$12,000 bonds for a street lighting plant.

Fulshear, Tex.—H. E. Thompson of this city wants estimates on an electric light plant of 200 thirty-two candle power incandescent lamps, and 15 2,000 candle power arc lights.

Greensborough, Pa.—The county commissioners propose to purchase an electric light plant for the courthouse and jail, to cost about \$1,700.

Harrisburg, Pa.—E V. Sinstein & Co. propose to install an electric lighting plant at this place.

Henderson, Ky.—The city council has authorized the employment of an electric light expert to make an estimate on an electric light plant to be owned by the municipality.

Irvine, Ky.—This city is preparing to grant a franchise for the construction and operation of an electric light plant, etc. Bids will be received until January 22. Address S. L. Tudor.

Jamestown, Ind.—Steel & Richmond contemplate the erection of an electric light plant in this place.

Manchester, Is.—An electric lighting plant will soon be erected in this city.

Morristown, Tenn.—In all probability this city will erect a new and larger electric light plant in the early spring.

Ocean Springs, Miss.—E. W. Wickey of Indiana is in the city looking over the field with a view of erecting an electric light plant.

Omaha, Neb.—Mayor Moore urges the city council to take immediate action to acquire an electric light plant.

Peaks Island, Me.—The electric light station at this place is to be entirely remodeled for service next season.

Perrysburg, O.—The electric light plant will soon be equipped for incandescent lighting.

Philadelphia, Pa.—The Woodbury Electric Light

Philadelphia, Pa.—The Woodbury Electric Light Company has decided to put in a plant for incandescent lighting.

Bichmond, Va—An electric light plant is to be erected on the site of the old Haxall Mills, to cost about \$1,000,000.

San Leandro. Cal.—The board of trustees of this city will advertise for bids to light the streets with electric lights. Parties interested in furnishing electric lights are invited to make propositions.

Sing Sing, N. Y.—A new electric lighting company has asked the village trustees for a franchise to put in an electric light plant here.

St. Louis, Mo —A \$6,000,000 corporation will erect a \$3,000,000 electric light and power plant to compete for the city lighting and furnish light, heat and power throughout this city and suburban towns. Plans have been prepared and bids will be advertised for in a few weeks. The stockholders are J. S. Walsh, A. Gehner, E. Benoist and others.

Syracuse, N. Y.—The Mayor recommends that the council and residents of this city unite in beginning preparations at once for the municipal ownership of an electrical lighting plant, which shall be ready for use at the end of the present seven years' contract for public lighting.

Tallahassee, Fla.—The city council has decided to erect a municipal electric light plant.

#### STREET RAILWAYS.

Allentown, Pa.—The Allentown & Bangor Street Railway Company is to construct an electric road from Catasauqua to Bangor, a distance of about twenty miles.

Amsterdam, N. Y.—A plan is on foot to connect this city with Ballston Spa by an electric road, a distance of 18 miles.

Defiance, O.—The People's Gas & Electric Company of this city, has enlarged the scope of its purpose so as to authorize it to operate an electric street railroad.

Jamestown, N. Y.—A letter has been received here from parties in New York City asking councils if a liberal proposition fer the building of an electric road in Corry and from that city to Chautauqua lake via Findley lake, would receive consideration. The New York parties will no doubt receive a satisfactory reply.

Joliet, Ill.—The Joliet Railway Company has been granted two 20 year franchises, one for an electric line from this city to Manhattan, a distance of eleven miles to the southeast, and one for a line from Joliet to Plainfield, a distance of nine miles to the northwest. The company is also preparing to build its line from Lockport to Chicago.

Joplin, Mo.—A new electric railway is projected for this city. The probable course will be via Galena Empire City. Baxter, Columbus and Weir City to Pittsburg. F. W. Blees of Macon, Mo., and J. F. Schaefer are interested in the enterprise.

Kansas City, Mo.—A company has been formed to build an electric line between here and Warrensburg, Mo., a distance of 38 miles. A. E. Holmes and A. M. G. ssett, of Kansas City, are among the promotors.

Logansport, Ind.—The directors of the Logansport, Richester & Northern Traction Company have authorized a bond issue of \$2.5.10,000. The proceeds will be utilized in the construction and equipment of the electric line to Kendallville.

Menominee, Mich.—Several Menominee County capitalists are considering the plan of building an electric street car line through the county at least to Powers. Power stations would be built in this city and at Powers. The line would necessitate the expenditure of \$200,000. I Carley, of Ingalls, G. T. Werline, of Nadeau, and others are interested in the project.

Milan, Mich.—An electric railway between this village and Ypsilanti is being projected and it is the intention of its promotors to extend the line to Adrian. R Hemphill of Ypsilanti has applied to the York township board for a franchise for the road through the township.

Milwaukee, Wis.—E. O. Humphrey, a promoter of Chicago, was in Milwaukee lately for the purpose, he says, of interesting capitalists in an elevated electric railroad which he expects to build between this city and Chicago.

Ortonville, Mich.—Messrs. Lau & Winters have secured a franchise through the township of Brandon for an electric railroad running from ()xford to Flint. Surveys are now being made.

Waukegan, Ill.—The Chicago & Milwaukee E ectric Railway may double-track its road to this city and build north. A new electric line from the harbor to the country west is also projected.

Wellsville, N.Y.—The village board has granted a franchise for the Wellsville & Bolivar Electric Railway, seventeen miles long, which Wellsville men, backed by New York capitalis's, propose to build. The cost of building and equipping the line is estimated at \$20,000.

Whitehall, N. Y.—This town has granted a franchise to the Whitehall & Granville Electric Railroad to run its lines through the streets.

#### MANUFACTURING, ETC.

Casey, I'l.—The council has awarded the contract for the erection of a joint system of waterworks and electric lights to the Commercial Electric Company of Chicago at a cost of \$36,000, the plant to be completed and turned over to the city June 15.

Dayton, O.—The Toledo Traction Company has placed an order with the Barney & Smith Company of this city for thirteen new street cars, to be delivered May 1.

Norfolk, Va.—The contract for the erection of an electric lighting plant at the navy yard, has been awarded to the firm of L. L. Leach & Son of Chicago, at their bid of \$73,371.

Pittsburg, Pa.—Lucin Marechal, chief engineer of the Paris, Lyons & Mediterranean Railroad of France, who is in this country on a tour of inspection, has placed an order with the Pressed Steel Car Company of this city for five hundred steel gondola cars of a special design. This order marks the introduction of American steel cars on the European Continent, and may be considered a new epoch in railway equipment in the Old World.

Schenectady, N. Y.—One of the largest of the recent contracts undertaken by the General Electric Company was closed January 11, when a \$600,000 order for electrical equipment and material was received as the result of competition with several foreign comparies. The order is from several Italian cities, one of which is understood to be Turin.

Trenton, N. J.—The Trenton Gas & Electric Company are about to make an addition to their works located on Chauncey street. It will consist of a building 89x 100 feet. One of the features of the new building will be a traveling crane with a capacity of fifteen tons, that will be placed so that it can be run the whole length of the building. The improvement will cost about \$200,000.

#### COMPANY MATTERS.

Auburn, N. Y.—The Auburn Electric Light, Heat & Power Company has purchased the English property in Steam laue adjoining its plant, for the purpose of constructing an addition.

Clear Lake, Ia.—The Clear Lake Electric Light & Power Company has decided to double the capacity of its plant. The power house will be rebuilt. The capital stock was increased from \$10,000 to \$20,000.

Colorado Springs, Col.—The El Paso Electric Company of this city passed into the hands of the Union Gas & Electric Company of New York City. The New York Company is in other words the trust, and the price it pays for the last company in this city holding out against the trust is \$385,000.

Galesburgh, Ill.—The Farmington electric light plant is likely to pass into the hands of Chicago capitalists.

Hammond, Ind.—The barns of the South Chicago Railway were destroyed by fire last week. Thirty-two cars were also destroyed. The loss, fully covered by insurance, is put at \$230,000.

Electric Light, Heat & Power Company has been sold to Newtown Jackson, of Stranton, representing, it is said, the United Heat, Light, Power & Transportation Company of Philadelphia.

Park City, Utah.—It is expected that the Park City Electric Light, Heat & Power Company will soon be merged into the Outario electric system.

Princeton, Ill.—The Princeton Electric Light Company has offered its plant for sale and the city may buy it.

Radford, Va.—The Radford Electric Light & Power Company contemplates the purchase of more dynamos or else the erection of another plant.

St. Louis, Mo.—The Imperial Electric Light, Heat & Power Company and the Consolidated Electric Company of this city have fied a certificate of consolidation under the name of the Imperial Electric Light, Heat & Power Company.

Trenton, N. J.—It is now said that the Stanley Electric Company, which has been bought by the Roebling Company of this city, will be operated by that company in connection with the Cramp Shipyard Company.

Warren, () —The Warren E'ectric & Specialty Company has doubled its capital stock, making it \$200,000.

#### POWER AND TRANSMISSION PLANTS.

Asotin, Wash.—An electric power plant, costing about \$400,000, will soon be installed on Asotin Creek. It is designed to run an electric street railway in Lewiston, Idaho, Clarkston and Washington. The electric power plant will also have sufficient power to supply several factories and flouring mills in Clarkston, as well as to furnish illumination for the town.

Warsaw, Ind.—The immense principal power house of the Logansport, Rochester & Northern Traction Company's electric line will be located here. It is estimated that the building will cost \$100,000.

## MINES, ETC.

Angels Camp, Cal.—It is learned on good authority that the Uvica Company will extend its lately installed electric-power line to Sonora, Tuolumne county, in the spring. This means a great thing for the mining industry in that county.

spring. It is means a great thing for the mining industry in that county.

Chamberlain, S. D.—The Chamberlain Electric Light Company has practically closed a contract with Mahanna & Johnston for drilling a new power artesian well in the near vicinity of the old one.

Pittsburg, Pa.—The Monongahela Consolidated Coal & Coke Company has decided to erect three electric power houses at Gastonville, Brownsville and Monongahela, along the river, to furnish power for the operation of its mining machinery. The stations will cost about \$150,000.

#### AUTOMOBILES.

Cleveland, O.—The Elwell-Parker Electric Company of this city will make automobiles. The president, F. C. Phillips, said "We shall have one of our vehicles running on the streets in a month or two."

Milwaukee, Wis.—It is reported that a company is being organized to run lines of omnituses in this city in competition with the street-car service. These 'buses are to be propelled by electricity and to have pneumatic tires. The estimated cost of each 'bus is \$1 600.

New York.—Cyrus Field Judson, president of the reorganized General Carriage Company of this city, has announced that the company will put into service 100 omnibuses and 200 cabs and carriages. Some of the conveyances will be operated by electricity, others by air power and others by gasoline.



## THE TELEPHONE WORLD.

### The Missouri Independents Meet.

The second annual convention of the Missouri Independent Telephone Association was held recently at the Lindell Hotel in St. Louis, Mo., and about twenty companies were represented. J. A. Hudson, of Macon, presided at the meeting, and Theodore Gary, of Columbia, acted as secretary.

Among those present were W. N. Wicks of Glasgow, C. E.

Among those present were W. N. Wicks of Glasgow, C. E. Betts of Fayette, John M. McCulley of Shelbina, George R. Armstrong of Pierce City, A. R. Ponder of Cape Girardeau, John Enoch of St. Charles, John E. Brooks of Cape Girardeau, A. A. Tibbe of Washington, John W. Lane of Carthage, and M. A. King of St. Louis. Mr. King and John W. Lane, president of the Carthage Electric & Telephone Company, were elected to membership in the association.

The question of incorporating the association was discussed and also the question of levying an assessment of 10 cents per year on each 'phone in use, the money to be used as a fund to defend the independent companies against the encroachments of the trust. After considerable discussion the president was authorized to appoint a committee to arrange for the incorporation and assessments, and John Enoch, John W. Lane, Theodore Gary and C. E. Betts were appointed on this committee. President Hudson is an ex-officio member.

A proposition to eliminate the clause in the by-laws which provides that no company represented in the association shall be entitled to more than three votes was also discussed, but no definite action was taken. The Kinloch Telephone Company of Missouri, which is not a member of the association, has, it is said, refused to join on account of this restriction, as it deems that on account of its relative size and importance it should be allowed more than three votes.

The attention of the delegates was also directed to the plans of the Kinloch Company to organize a company for the purpose of constructing an independent long-distance telephone line across the State of Missouri from St. Louis to St. Joseph and Kansas City, and thence down to Joplin and the adjacent towns.

A meeting of the directors of the Kinloch Telephone Company was held after the regular meeting, but President Kennard is reported as saying that only routine business was transacted, and that no proposition to join the Missouri Independent Telephone Association was discussed. Another meeting of the association will be held in the spring.

For weeks past there have been rumors of an attempt by outsiders to secure a controlling interest in the Detroit Tele Company for the purpose of consolidating it with other independent concerns to fight the old companies. It is now stated that these attempts have not been made by any other independent company, Lut by C. J. Glidden, of Lowell, Mass., president of the Erie Telephone Company, a corporation which has purchased the Bell lines in Michigan, Texas, Wisconsin, Minnesota, North and South Dakota, Oklahoma, and the city of Cleveland. Mr. Glidden has been in Detroit frequently of late, and made overtures to stockholders in the Detroit Company for the purchase of their stock. The stockholders say the offers are too low, and that there is no danger of their selling at any price unless the purchasers will make some sort of an agreement to protect the new State Telephone Company. Practically no attempt has been made to secure control of the latter, for the reason that the stock is scattered all over the State in small holdings.

The Citizens Electric Light & Power Company of St. Louis, which was organized three years ago for the purpose of laying telephone wires and conduits in that city, but which has been inactive since its incorporation, has decided to commence operations, and will increase its capital stock from \$1,000,000 to \$3,000,000. At the time of its formation the city granted it the frai chise for the laying of subways. Its charter also permitted it to make and sell electricity for lighting, heat and power purposes. The company has decided to go into the electric business on a large scale, and a plant will be receted in East St. Louis. C. J. Hopkins Hanford, a director of the People's Telephone Corporation of this city, who formed the Kinloch Telephone Company of St. Louis, which is the owner of a majority of the stock of the Citizens' Electric Light & Power Company, is reported as saying that the company intended to be a strong competitor for electric business in St. Louis.

Judge Goff, of the United States Circuit Court has rendered an opinion in the case of the city of Richmond, Va., against the Southern Bell Telephone Company, which is a victory for Richmond. Some years ago the franchise of the telephone company expired, the city declined to renew it and ordered the company to remove its poles and wires. The company refused and secured an injunction restraining the city from interfering with the company on the ground that the streets are post roads of the United States. The case went to the Supreme Court. Judge Goff was reversed, and the matter was remanded. Judge Goff rendered an opinion in accordance with the Supreme Court's mandate, dissolving the injunction and dismissing the bill.

#### Kansas City's Telephones.

The growth of the telephone has been phenomenal, says the Kansas City (Mo.) Journal. Its importance as a factor in the mercantile world was acknowledged long before it had been perfected for practical use and as soon as its successful operation was assured it became an absolute necessity. To the professional man it was equally indispensable and almost simultaneously it found its way into private residences and homes. Now its installation is almost universal. The busy man of affairs must have it right at his hand at all hours of the day and night, the society woman and the careful housewife is no longer content to make a trip to a neighboring drug store when she wishes to use it. The person without a telephone is practically buried in a large city.

The telephone has been a prime factor in the building up of large cities. It makes a suburban residence even endurable. It annihilates time and space with equal facility. The housewife need no longer make countless tiresome trips downtown doesk and hold personal conversation with a patron in any part of the country. Its agency makes a resident in any other city, North, South, East or West, a next door neighbor. It has never been a luxury and its necessity is now universally conceded. No less than 440 toll stations, or stations outside the city, are now connected with the local system.

Kansas City has now 4,800 telephones in daily use as compared with 3,500 at the commencement of 1899, and so far from the demand showing any signs of being fully supplied, it is increasing constantly. In addition to the large number of local 'phones, the system is connected with over 400 thriving towns in the adjacent and tributary country. The long-distance service is being constantly added to until now its tentacles of wires embrace the entire country. Direct communication is now had by Kansas City with all principal points in thirty two States.

The minority stockholders of the Newark (N. J.) Telephone Company, says the N. Y. Tribune, propose to organize for the purpose of engaging counsel to look into the recent sale of a controlling interest in the company and to protect the minority interest. The sale of the majority of the stock was effected last November by Thomas A. Nevins and Samuel Doty to Colonel J. B. Curtis, who lately secured control of the Hudson Telephone Company of  $\,$  Jersey City. It is alleged by minority stockholders that the New York & New Jersey Telephone Company is back of Colonel Curtis, and intends to reorganize the Newark Telephone Company, have it sold out and buy it in on terms that will leave the minority stockholders out in the cold. Mr. Nevins holds a claim of \$86,910.36 against the company for construction and it is feared that the concern will be closed out at a figure just to satisfy that claim. There is a question whether the company has not by non-fulfilment of its franchise forfeited its rights and also the ownership of the subways laid. The Board of Works has the option of revoking the franchise under certain

Six inches of snow has caused the suspension of work on the long distance telephone line under construction by the Sunset Telephone Company in the Bradshaw mountains of Northern Arizona, says the Los Angeles. Cal., Heral I. The force has been transferred to a point still farther north, and preparation has been made for rechanging it to the extreme southern end of the line, building south from Tucson in case of more snowing north. At places where hills and mountains are being crossed by the line, burro trains are put in operation. They make an important auxiliary to the force in carrying poles over the mountains. The telephone system recently established in Tucson is meeting with success beyond former expectations of the manager. There are more than 200 phones in operation.

A new telephone line, connecting Middleport, N. Y. with Johnson's Creek and Jeddo, has been constructed by E. B. Crosby of Lockport, N. Y. The line has been named the Ridge Road Telephone Line. There are now about eight miles of poles and wires up and the line is in fine working order. The residents and shippers along the ridge are enthusiastic about the new line as it is the first electric communication the town of Hartland has ever had with the outside world. The enterprise is enjoying a good patronage and will, it is said, be extended as soon as the weather permits.

A dispatch from Waupaca, Wis., states that the Wolf River Telephone Company has completed the purchase of the lines and franchises of the Badger Telephone Company. The latter had about fifty miles of toll line besides an exchange in Waupaca. The Badger line extends from Waupaca into Waushara County and will make an important feeder to the Wolf River system.

There is said to be strong talk of extending a telephone line from Mason City, Neb., to Ansley and then to Broken Bow. There is now a line from Mason City to Loup City via Litchfield. The East Tennessee Telephone Company, which operates in Bristol, Va., has advanced the price of service from 100 to 200 per cent. Residence phones have been raised from \$1.50 each per quarter to \$3, and business house phones from \$1.50 to \$4.50. The advance has resulted in a kick, and the company is losing subscribers. The situation is said to be pleasing to the Bristo! Telephone Company, which has an exchange in Bristo!

The Mississippi Valley Telephone Company announces that over one half million of dollars has been invested already in the exchange in Minneapolis, Minn., that it is connecting up the instruments as fast as possible. The company has now in operation in Minneapolis 1,300 phones and by the 20th of this month will have 300 more. In St. Paul 700 'phones have been connected and by February 1 there will be from 1,300 to 1.5(0 in operation).

The supervisors of San Francisco, Cal., have passed an amended telephone tax ordinance to meet the objections of Mayor Phelan, who vetoed  $\alpha$  previous ordinance some weeks ago. The new ordinance places a tax on all telephones instead of on nickel-in-the-slot machines alone. The tax amounts to 50 cents per quarter.

Probably the world's first aluminum telephone system is in operation between Pittsburg. Pa., and New Kensington, a distance of eighteen miles, and is so much of a success that it is said the Pennsylvania Company, operating lines west of Pittsburg, has ordered a similar system to be used in connection with the heavy copper system now in use.

The independent telephone companies of Michigan will hold their annual meeting at Battle Creek on February 9. There will be at least one hundred representatives composed of hustlers in the independent field. The association will be entertained by the Calhoun County Telephone Company.

The Cumberland Telephone Company has completed a toll line into Bowling Green, Ky. It is an extension of the line from Central City and includes Rochester, Morgantown and other Green River points. At Bowling Green connection was made with Franklin, and forty or fifty other points.

At a special meeting on January 11 of the Gloucester, N. J., city council an ordinance permitting the Telephone Company of New Jersey to erect poles and string wires through that city was passed on its final reading. The new company has been organized in opposition to the Bell Cempany, and will cut rates.

The wire mileage of the Erie Telegraph & Telephone Company system was increased during the year 1889 as follows: Long distance poles set 3,127 miles; long distance wires strung, mostly copper, 25,552 miles. Grand total miles in operation: Pole lines 19,123 miles; wire 196,349 miles.

The Fairmont Telephone Company, of Fairmont, Minn. held its annual meeting on the 2d inst. and reported a prosperous state of affairs, declared a 12 per cent. cash dividend, elected the old board of directors, and adjourned.

The Knickerbocker Telephone Company of New York City, is making preparations to build a telephone line through the Borough of Queens and to all the principal villages of Nassau and Suffolk counties.

The Cumberland Telephone & Telegraph Company will put in an exchange at Earlington, Ky.

### TELEPHONE INCORPORATIONS.

The American Telephone Repeater & Quad Company, Dover, Del. Capital stock \$200,000.

The Saline County Telephone Company, Galatia, Ill. Capital stock, \$10,000. Incorporators: Charles Temple, George H. Mitchell and T. E. Webber.

The Carolina Telephone & Telegraph Company, Tarborough, N. C. Capital stock, \$50,000. Incorporators: George A. Holderness, W. H. Powell and W. H. McNair.

The Black River Telephone Company—to operate a telephone system between Utica and Watertown, N. Y. Capital stock §25,000. Incorporators: John J. Dollser, Philip Dollser, Frederick F. Myers, S. C. Capron, Benedict Gautner, H. C. Markham, David Swoncott and Frank Harrington.

The Canal Dover Home Telephone Company—to operate a system in Tuscarawas County, O. Capital stock, \$40,000. Incorporators: D. T. Croxten, D. Defenbacher, A. Deis, C. H. Slingluff and C. D. Juvenill.

The Mugg Telephone Company—to operate in Owen County, Ind. Capital stock, \$1,000. Incorporators: Joseph T. Mugg, B. Frank Mugg and Thomas H. Morris,



## \_ECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electricity from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gcn., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mig., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

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Coney Island & Brooklyn RR Kings County Elsvated Kings County Traction Co	100	4,750,000	4,700,000		3 15		Memphis Tenn.—Jan 15: Memphis Street Railway Co	100	500,000	500,000	**************	25	_
Kings County Traction Co	100	4,500,000 6,000,000	6,000,000	1 % July 26, '97	76	17	New Haven, ConnJan 15;	-00	333,333	555,050			_
/Atlantic Avenue Railroad	50	2,000,000	2,000,000	•••••	::	::	Fair Haven & Westville PP	25		2,000,000	8 % S., Sept. '98. 2½ % A., July '96.	46	
Buffalo N. YJan 15:		2,000,000	2,000,000			"	New Haven Street Railway Co New Haven & Centerville	100 100	700,000	<b>800,0</b> 00	************	***	
Buffalo & Niagara Falls Elec. Ry			1,250,000	1 % Q. Dec., '98.	7±	75 102	Winchester Avenue RR	25	1,000,000	600,000	•••••	47	-
*Buffalo Railway Co	100	6,000,000	3,510,500	1 76 Q. Dec., '96.	103	102	New Orleans, La.—Jan 15: Canal & Claiborne RR. Co	40	240.000	240.000	4 % S., July, '98.	<b> </b>	١
Columbus O.—Jan 15 Columbus Street Bailroad	100		8,000,000	1 % Q., Feb., '99.	20	22	New Orleans & Carrollton RR New Orleans Traction Co new com.	100 100	1,200,000		1 % 8., July, '98. 1 % % Q., Oct., 98.	148%	
Oolumbus Central Street Railroad	100	1,500,000	1,500,000	•••••	••	••		1 100			1	101 201	102
Charleston, S. C.—Jan 15	-	100 000	100 000			İ	aCrescent City & RR	100	2,000,000	2,000,000	8 % S., Jan., '99. 4 % S., Jan., '99. 1 ½ %., June, '94. 1 ¼ %. Oct., '98.		
Charleston City Ry. Co	50 25	100,000 1,000,000		• 79 Es		::	St. Charles Street Railway	50 50		1,000,000	1½ %., June, '94. 1½ %. Oct., '98.	561/9	52 87
Chicago, Ill.—Jan 15.		İ					New York-Jan 15:						
Ohicago City Ry. Co Ohicago & South Side R. T. RR	100	12,000,000	12,000,000	8 % Q., Dec. 81, '98	275	280	Central Crosstown RR	100	600,000 650,000	600,000 650,000	2½ % Q, 2 % Q., Oct., '98.	275 168	280 174
Lake Street Elevated RR	100	10,000,000	10,000,000	8 % Q., Dec. 81, '98	173/4	18 81 %	Dry Dock, E. Brdw'y & Battery RR. dMetropolitan Street Ry. Co	100	1,200,000	1,200,000	11/2 % Q., Nov., 98.	125 164	150 1641/4
Metropolitan West Side Elev, Ry Met. West Side El. const. stk North Chicago Street RR	107	15,000,000	2,500,000	8 % Q . To 00	284	235		100	900,000	900,000	% A., July, '98.	85 280	40
North Chicago City RR						••	Broadway & Seventh Aveguar. gCen.Park,N.&E. Rivers RR. guar hEighth Avenue RR	100	1,800,000	1,800,000	2½ % Q. 2 % Q., Oct., '98. 1½ % Q., Nov., 98. 1¼ % Q., Jan., '99. ½ % A., July, '98. 2½ % Q.	195	240
North Chicago City RR. South Chicago City Railway West Chicago St. RR. Co jChicago West Div. Ryguar.	100	20,000,000	18,189,000	1½ % Q., Feb. 99.	117	117%		100	750,000	748,000	4% % Q.	39 <b>5</b>	410 410
Ohicago West Div. Byguar. Ohicago Passenger Byguar.	100	1,250,000 2,000,000	824,900 2,000,000	5 % B.	::	85	Ninth Avenue RRguar.	100 100	800,000 2,000,000	800,000 2,000,000	**********	1 <b>95</b> 209	205 211
Cincinnati. Ohio.—Jan 15:			·		l		Second Avenue RR	100 100	600,000 2,500,000	600,000 1.862,000	4½ % Q. 2% Q., Jan., '99. \$1.75 p. sh. Feb. 99.	898 200	420 205
Dincinnati Inc. Plane Bycom.	50	1 000 000	575,000	*****	١		m42d St. Manhaty'le & St Nich A	100	12,000,000 2,500,000	10,000,000 2,500,000	\$1.75 p. sh. Feb. 99.	184	12314
Dincinnati Inc. Plane Rypfd. Dincinnati, Newport & Cov. St. Ry.	50	1,000,000	150,000	% % Feb., '99. 2% % Feb., '98. 1% % Q., Jan., '98. 1% % Q.,Jan., '98.	89	89	Chion (Hude) - Derry) Ry	100	2,000,000			190	200
Cincinnati Street Ry. Co	100 50	18,000,000	14,000,000	12 % Q., Jan., '98,	1203	121	Newark N JJan 15: Consolidated Traction Co. of N. J	100	15 000 000	15 000 000			
Cleveland, Ohio.—Jan 15:	50	2,500,000	2,200,000	176 76 West Baller, 196.		••	North Jersey Street Railway Col	100		6,000,000	*********	64 29%	65 81
Kron, Bed. & Olev. Elec. By	100	1,000,000	1,000,000	% % Jan., '98 8-5 % Jan. '99.	48	50	United Electric Co. of New Jersey Pittsburg, Pa.—Jan 15:	100	504,000	504,000	11% % A.	80	81
Dieveland City Ry Dieveland Electric By	100	8 000 000	7,600,000 12,000,000	8-5 % Jan. '99. % % Q., Oct., '98.	90	100 °	Allegheny Traction (to	50	500,000	500,000	*********	54	55
Detroit, Mich.—Jan 15		_,,					Consolidated Traction Cocom.	50 50	15,000,000 15,000,000	15,000,000 15,000,000	2 %, Jan., '95, 8 %. Nov. '98.	25 61	26 62
Detroit Citisens' Street Ry	100	2,000,600	1,250,000 1,200,000	**********	1003 175	••	gOitizens' Traction Co	50 50	1,500,000	1900,000	1% % Nov. 7, '98.	69	•••
Rapid Railway Co	100	250,000			90	100	Pittsburg Traction Co	50	8,000,000	18,000,000	6 % A.	ļ }	70
Vyandotte & Detroit River Ry	100	1,000,000 <b>250</b> ,000		**********	100	iio	Fed 3ral Mt. & Pleasant Valley D.	50 25	1,400,000	1,400,000	6 % A. 8½ %, Nov. 7, '98, 2½ %, July, '98.	28	28%
Dayton OJan 15;		·		17 4 4 4		, ,	Pgh., Allegheny & Man. Trac. Co Pittsburg & Birmingham Trac. Ry	50 25	8,000,000	12,994,809	2 75, Aug., 90.	1::	4884
Hty Railway Copfd.	100	1,500,000 600,000	1,470,600	888	1263% 160	::	United Traction Co	50	1,500,000 17,000,000	1,500,000 17,000 000	5 % A., June 30, 98,	j;	••
eople's Street Railway	100	1,100.000	1,100,000	171.71 44	114	115	United Traction Copref.	50	17,000,000 8,000,000	17,000 000	J. & J. J. & J.	12	16 47

\*Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consol dated Railways Company, the Baltimore Otty Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co of Baltimore. The pref stock of U R & E'ec Co has been issued in the form of income bonds.

b Leased to B ston E evated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to B rooklyn Rapid Transit Company.
d Leased to B rooklyn Rapid Transit Company; road operated by Brooklyn Rapid Transit Company; road operated by Brooklyn Rapid Transit Company; road leased to Nassau Electric RR.
g Owned by Atlantic Ave RR and leased to Nassau system.
h \$30 per share on outstanding capital paid as rental by lease—West Ohicago St. RR. Co.;
\$250 100 of stock owned by North Chicago Street Railroad Company.
i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$625,100 of stock owned by West Chicago Street Railroad Company; 5 % on \$1,000,000 stock guaranted by West Chicago Street Railway Company; 5 % on \$1,000,000 stock guaranted by West Chicago Street Railway Company, lessee.
Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

\*\*Unlisted. † Full paid. [Outstanding. ‡ Ex-div.
a Leased to New Orleans Traction Company at 8% on stock.
b Leased to New Orleans Traction Company at 8% on stock.
c Leased to New Orleans Traction Company at 8% on stock.
c Leased to Central Crosstown Railroad at 8% on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway.
g Leased to Metropolitan Street Ry. at 8% on stock until Oct. 1, 1897; thereaft r 9%.
h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1895, at \$215,000 per annum.
i Leased to Metropolitan Street Railway for 18% on stock
j Leased to Metropolitan Street Railway for 18% on capital stock.
m Controlled by Third Avenue Railway for 18% on capital stock.
m Controlled by Third Avenue Railway for 18% on capital stock.
n Dividends of 13% yearly guaranteed by Consolidated Traction Company.
o Controls by lease the Alleg'ny, Cent., Oitizens' Dunquesne, Fort Pitt & Pitt'h Traction.
p Leased to Consolidated Traction Company for 6% on \$3,000,000 capital stock.
g Leased to Consolidated Traction Company for 6% on capital stock.
s Leased to Consolidated Traction Company for 7% on capital stock.

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PASSEI	٧G	ER I	RAILW	AYS.			TELEPHONE	A	ND TE	LEGI	RAPH COS	• '	
NAME.	Par	Capital Authors'd		Rate and Date of Last Div.	Eid.	Asked.	NAME.	Par	Capital Authors'd		Bate and Date of Last Div.	Bid.	Aske
New Bedford Mass-Jan 15 Union Street Railway Co	100	\$850,000	\$850,000	2 %, Feb. 98.	160	165	Boston, Mass.—Jan 15. American Bell Telephone Co Erie Telegraph & Telephone Co	100	50,000,000	28,650,000	1 % Q., Jan., '99 1 % Q., Feb. 20, '9 \$1.50 p. sh. Feb '99	£31 9 104	37 1043
Northampton, Mass-Jan 15 Northampton Street Rv Omaha, NebJan 15:	100	800,000	225,000	4 % A., June '98,	170	178	New England Telephone Co  New YorkJan 15:						
Paterson, N. J. – Jan 15:	100			3 % A. and N.	55	65	American Telegraph & Cable Co  *Central & South Am. Teleg. Co  *Commercial Cable Co	100 100 100	6,500,000 10,000,000 1,000,000	6,500,000 10,000,000	1½ % Q 1½ % Q. 1½ % Q. 1½ % S. 1½ % S. 1½ % Q. 1½ % Q.	96 114 1901 42	99 117 193 50
Providence, R. L-Jan 15				5/2 %, Oct. '98,	108	108%	*Gold & Stock Telg. Coguar. 6 %.	100 100 100	5,090,000 5,000,000 8,000,000	4,800,000	1 % Q., Feb., '99. 1% % Q. 1% % Q.	112 1183 115	118 119 117
Inited Traction & Electric Co Philadelphia,—Jan 15. airmount Park Trans. Co\$50 pd.	50	2.000.000	1.770.000	2 % Dec. '97.	28	24	*New York & New Jersey Tel. Co *Pacific & Atlantic Telegguar. 4 % *Postal Telegraph Cable Co	100	5,000,000	8,728,000	2½ % Q., Jan., '99.	170	175 82
[estonville, Man. & Fairmount [est'nvl'e, Man. & Fairm't6 % pfd. aFairmount Pk. & Had. Pass. By. [nion Traction Co	50 50 50	80,000,000	29,980,450	2%%, July 15, '98. 3% S—July, '98. 3% Feb. 1, '98.	47 75 75 41	48 76 16 41 <sup>1</sup> / <sub>4</sub>	*Postal Telegraph Cable Co *Sout'n & Atlantic Telg. Co.guar. 5 % †Commercial Union Telegraph Co Western Union Telegraph Co †Div. guar. by Postal Teleg. Co.	25 25	950,000 500,000	559,525 500,000 97,870,000	1 % Q. 2½ % S. 8 % S., Jan., '99. 1½ %, Q. Jan. '99.	114 115 863	116
ditizens' Passenger Ry Frankford & Southwark Pas. R Lehigh Avenue Ry. Co	50 50 50 50	500,000	1,875,000	\$8 share Q. \$14 sha'e A—Apr.98	48	451	Miscellaneous Jan 15: American Dist. Teleg. (Phila.) Bell Teleph. Co. (of Canada.)	25 100	400,000 8,960,000	8,561,000	1 % Q.	21 188	84
dSecond & Third Streets Ry	25 50 50	1,060,000 10,000,000	1,000,000 †771,076	A. & O. \$9 share A, Mar. 98 3 %, A., April, '98. \$5.25 share—1898.	90 300	901/2	Chesapeake & Potomac Telep. Co Chicago Telephone Co	100 100 100	750,000	750,000	• · · ·	76 200 148	97 210 150
gGermantown Passenger Ry gGreen & Ooates Passenger Ry. hPeople's Passenger Rycom.	50 50 25	1,500,000 500,000 1,500,000	572,800	8 % Jan., 1898.	144	145 152	Central Dist Prig & Telg.Co.(Pgh.). Empire & Bay States Telegraph Co. Hudson River Telephone Co *Northwestern Telegraph Coguar	100	2,000,000 2,500,000	2,000,000		75 114 115	76 115
hPeople's Passenger Rypfd. (Philadelphia Traction Co (Oatherine & Bainbridge St		750,000	277 402			961/4	Providence (R. I.) Teleph. Co Southern New Eng. Teleph. Co	50 100		2,300,000	***************************************	90	:
*Continental Pass. Ryguar *Empire Passenger Ry. Co	50 50 50	1,000,000 600,000 1,000,000	600,000	en ro 1 T-1-100	202	157 208	ELECTRIC LIGHT A	W	D ELE	OTR	OAL MFG	. 0	0.5
Philadelphia City Pass. Ry Philadelphia & Gray's Fy. RR Ridge Avenue Passenger Ry	50 50	1,000,000 750,000	298,650 420,000	\$7.00 share July '98 \$3.50 share July '98 \$12 share July, '98. \$2 share July, '98. 1½ % S., July, '98. \$11 sh. A., July, '98 \$9.50 shre, July '98 \$10 share, July '98	100 3.83/4	309	Boston, Mass.—Jan 15: Fort Wayne Electric trust receipts	25				115	125
Philadelphia & Darby Ry.guar. 117th & 19th Sts. Pass. Ry. guar Thirteenth & 15th Sts. Pass. Ry.	50 50 50	1,000,000	200,000 250,000 335,000	\$2 share July, '98. 1½ % S., July, '98. \$11 sh. A., July, '98	800	::	Ft. Wayne Elec Co. T. Sec. Series A. †General Electric Co. [old] com. General Electric Co. [new] †TH. Elec. Co. T. Secur., Series D.	100	40,000,000 18,276,000	80,460,000 18,276,000	2 % Q., Aug., 1898. 1% % Q., May '99.	25	118
iUnion Passenger Ry. Co iWest Philadelphia Pass. Rv	50 50	1,500,000 750,000	750,000	\$9.50 shre, July '98 \$10 share, July '98	289 250	240	TH. Elec. CoT. Secur., Series D. Westinghouse Elec. & Mfg. Co. com. Westinghouse El. & Mfg. Co. pfd. Westinghouse El. & Mfg. Co. assent.	50 50	4,000,000	146,700 8,996,058	15/4 % Q., Jan., '99.	1221/2	1235
ochester, N. YJan 15:	100	5,000,000	5,000,000	******	13	14	New YorkJan 15:	50	11,000,000	8,195,126	•••••		-
eading PaJan 15.  Beading Traction Co		1,000,000	1,000,000	Semi-an.,Jan. & Jy	24	26	Edison Elec. Ill'g Co., New York *Edison Elec. Ill'g Co., Brooklyn Edison Ore Milling Co	100 100 100	9,188,000 4,000,000		1½ % Oct., '98.	119	120
kCity Passenger RylEast Reading Electric Ry	50 50	850,000 1,000,000	\$50,000 \$1,000,000	Jan., '98. Jan., '98.	138 70		Electric Vehicle Cocom.	100	40.000.000	80.460.000	2 % O. Ang., 1898.	82	92
t. Louis MoJan 15 burth Street & Arsenal Ry offerson Avenue Ry. Co	50 50	800,000 400,000	150,000 400,000	2 % Dec., 1888.	::	::	Interior Conduit & Insulation Co Kings Co. El. L. & P. Co	100 100 100	1,000,000 2,500,000	1.000,000	1½ % Q., May '99. A. & O.	1.31/4 41 110	123
ndell Ryational Railway Co	100		2,400,000 2,479,000	2 % Dec., 1888. 1¼ % Jan., '99. 1½ % Jan. '99.	::	::	Pittsburg, Pa.—Jan 15 Allegheny County Light Co	100	500,000	500,000	J. & J	168	172
St. Louis RR	100 100	2,000,000 2,000,000	1,500,000 2,000,000	4 %, Oct., '98. 2½ %, Jan., '99. 1½ % Jan., '99. 50c., Dec., '89.	::	::	East End Electric Light Co Philadelphia, Pa.—Jan 15	50	800,000	800,000	Q.	•	
issouri RReople's RR. Co	50 50 50	500,000		1½ % Jan., '99. 50c., Dec., '89.	::	::	Edison Electric Light Co *Electric Storage Battery Cocom. *Electric Storage Battery Copfd.	100 100 100	8,500,000	:::::		120	150
Louis & Suburban Ry	100 100 100	2,500,000	1,000,000 2,500,000	3 %, Jan., '99. 3 % A., July, '95.	76	78	Northern Elec. Light & Power Co Southern Elec. Light & Power Co	10 10	5,000,000 550,000 187,500	550,000 187,500		80	120
an Francisco, Cal.—Jan.	100		600,000	50c. monthly.	116		Miscellaneous.—Jan 15: Bridgeport (Conn.) Elec. Lt. Co Missouri-Edison (St. Louis)com.	25	500,000			47	43
eary Street Park & Ocean RR	100 100 100	1,000,000 18,750,000	875,000	\$2.50 share, '96. Q., 60c. per share.	62½ 62½	68 16	Eddy Electric Mfg. Co	25 100 25	850,000 175,000			25 18 %	162
cranton, Pa –Jan 15 granton Railway Co	50				29	80	New Haven (Conn.) Elec. Lt. Cc Narragansett (Prov., R.I.) Elec. Co.	100 50	100,000 1,200,000		2 % Q., Oct., '98.	95 95	100
Scranton & Carbondale Trac. Co Scranton & Pittston Traction Co	100 100	500,000	500,000		16%	::	Royal Elec. Co. (Montreal)	100	1,000,000 1,085,000	1,085,000	2% Q 134 % Q 8 % S, Dec. 1, 96.	118±4 198 18:	195 198
pringfield Ill.—Jan 15: pringfield Consolidated By	100	750,000	750,000	***************************************			Thomson-Houston Welding Co Woonsocket (R. I.) Electric Co †On Aug. 17 last by a majority vot				• • • • • • • • • • • • • • • • • • • •	105	100
pringfield OJan 15 pringfield Street Ry	100	1,000,000	1,000,000			11	to \$20,827,200, of which \$18,276,000 is c Recently acquired the Edison Illu	omn	on and \$2	551,200 pr	eferred.	1 Ex	div
pringfield, Mass.—Jan 15:	100	1,200,000	1,166,700	8 <b>% A</b> .	207	212	pany, the Municipal Electric Light (		INDUS	TRIE	s.		End (
oronto Canada.—Jan 15	100	6,000,000	6,000,000		106	1053/4	Boston Mass.—Jan 15: Delaware Gas Light Cocom	50	E00 000	E00 000		POL	
Vashington, D. C.—Jan 15:		4,000,000	4,000,000	4 % 8.	811	912	Delaware Gas Light Copref.	50 50	10,000,000	500,000 200,000	J. & J.	72% 98	=
elt Ry. Coapital Traction Co	50 100	500,000 \$12,000,000 \$00,000	500,000 12,000,000	65c. per sh, Oct. 97.	943/8	941/2	Street Ry. & Illu'g Propertiespfd United Electric Securities Copfd.	100 100	4,500,000	1,248,700	\$2 p. sh. Jan. 26, '99 \$8.50 p sh. Nov' 38.	::	100
olumbia Ry. Co	50 50 50 50	707,000 200,000	400,000 652,000 200,000 458,900		85	40	New York.—Jan 15: Oonsolidated Electric Storage Co Safety Car Heating & Lighting Co Worthington Pump Cocom	100	5,500,000	5,500,000		10 150	20 155 110
Vorcester, MassJan 15: Worcester Traction Co6 % pfd. Vorcester & Suburban Street Ry	100 100 100	2,000,000	2,000,000	8 % S., Feb., '98. 4 %, 1897.	291/4 1041/2 1	30% 105% 85	Worthington Pump Copfd Philadelphia Pa.—Jan 15: Slectro Pneumatic Trans. Co Juited Gas Improvement Coscrip	100 10 50	1,500,000 10,000,000	2,000,000		1	13/ 162
Wilkesbarre, Pa.—Jan 15; filkesbarre & Wyoming Val.Trac	100	5,000,000	5,000,000	1%, Jan., '97.	25	29	Welsbach Commercial Coeom Welsbach Commercial Copfd Welsbach Light Co	100	8,500,000 500,000 525,100		2 X Q	113/4 57/2 89/2	117
*Unlisted. † Paid in. † Full r a Leased to Hestonville, Man & b Consolidation Electric, Peop charges and all indebtedness of c	Fair	and Ph	ssenger k	y, for 6 % on stock Traction compar	nies.	Fixed	Welsbach Light Co., Canada Pittsburg, Pa.—Jan 15: Jarborundum Mig. Co	.00	200,000	200,000		15/8	13/4
Traction Company. c Practically all shares owned by d Lease to Frankford & Southwa e Leased to Electric Traction Co	by U	nion Trac Passenger any.	tion Comp	pany. med by Electrie Tr			Miscellaneous.—Jan 15: Barney & Smith Car Cocon	100	1,000,000	1,000,000		. 2	170
f Controlled by Frankford & So g Leased to People's Passenger	Rail	wark Pass way at \$5	per share.				*Barney & Smith Car Copfc Billings & Spencer Co Oonsol. Car Heating Co	25 00	1,250,000	2,500,000	2 % 1% % Feb. '98		10)
h Majority of stock owned by P i Leased to Union Traction Com j Lease transferred to Union Tra-	pan	y. on Compan	nv.				Johns-Pratt Co*Pratt & Whitney Cocon	00				95	135
jj Leased to United Traction Oc p.a. \$20,000 in 1899-1900 and \$30 000 declared as a dividend semi-annual	per l	annum th	ereafter,	payable semi-annu	in l	866-7-8 rental,	Sillwell-Bierce Copf	00			2 % Sept 1, '98.	96	52
k Dividend of 10 % guaranteed	by R	teading Tr	action Co	mpany.			Shultz Belting Co	.0	500,000			89	106

# BONDS.

PASSEN	SER R	AILWA	Y.				PASSENGER RAILWAY.							
	Amou			Interest				-	unt.		Interest			
NAME.	Authorized.	Issued.	Due	periods.	Bid.	Askol.	NAME.	Authorized.	Issued.	Due	periods.	Bid.	Asket	
Albany N. Y.  Date of Quotation—Jan 15, 1000  The Albany Ry. Co	\$500,000 750,000 850,000 150,000	\$29,000 427,500 875,000 850,000	1940 1947 1919	J. & J. M. & N. M. & N. M. & N.	*126	1271/6	Dete of Quotation—Jan 15, 1900.  Canal & Claiborne RR cons mig. 6s. Crescent City RR lest mig. 6s. Orescent City RR lest mig. 6s. New Orleans City RR lest mig. 6s. jN. Orl's City & Lake RRlst mig. g. 5s. N. Orleans & Carrollton RR. 2d mig. g. 6s. Orleans Rallroad Co Cons. mig. 6s. 184. Charles St. RR. Co lst. mig. 6s. 18428,500 in escrow to retire New Orleans City RR. Co.'s 1st mig. bonds. 1890,000 outstanding.  New YOPK.	5,000,000 416,500 5,000,000 850,000 800,000 800,000	50,000 8,000,000 899,000 2,599,500 850,000 800,000	1899 1948 1908 1948 1907 1912	M. & N. M. & N. J. & J. J. & D. J. & J. F. & A. J. & J. J. & D.	105½ 108 112	112 118	
Baltimore Md.  Date of Quotation—Jan 15, 1400.  United Electric Ry. Colst mtg. g. 4s.  Baltimore City Pass. Rylst mtg. g. 5s. Baltimore Traction Colst mtg. 5s. Baltimore Trac. Co. Exten. & Imp. g. 6s, 5s. Bal. Trac. Co. Coll. Trust. lst mtg. g. 5s. Bal. Trac. Co. Coll. Trust. lst mtg. g. 5s. Baltimore Traction Co. Convertible 5s. Central Pass. Ry. Colst mtg. 6s. Central Pass. Ry. Colst mtg. g. 5s. City & Suburban Rylst mtg. g. 5s. Lake Roland Elev.,lst mtg. 5s.	88,000,000 14,000,000 2,000,000 1,500,000 1,250,000 1,750,000 750,000 96,000 604,000 8,000,000 1,000,000	1,500,000 1,250,000 1,750,000  117,000 580,000	1949 1911 1929 1901 1942 1900 1906 1912 1982	J. & D. M. & N. M. & N. M. & S. J. & D. J. & J. N. & M. J. & J. M. & N. J. & D.	102 74 <sup>8</sup> / <sub>4</sub> 118 <sup>7</sup> / <sub>8</sub> 119 104 <sup>1</sup> / <sub>4</sub> 121 101 102 <sup>1</sup> / <sub>2</sub>  119 116 117	102½,4 75 120 121½,6 121 121	Date of Quotation—Jan 15, 1800.  Atlantic Ave. (Brooklyn)Imp. g. 5s. Atlantic Av. (Brooklyn)tons.mtg.5s. †Atlantic Av. (Brooklyn)Cons.mtg. 5s. Brooklyn & 7th Avelst ons. g. 5s. Broadway & 7th Avelst mtg. 5s. Broadway & 7th Ave2d mtg. 5s. Broadway Surface1st mtg. 5s. Broadway Surface	759,000 8,000,000 12,500,000 1,500,000 500,000 1,125,000 1,000,000 2,000,000 1,000,000 2,000,000 250,000 8,500,000	1,966,000 7,850,000 1,500,000 500,000 1,125,000 1,000,000 2,000,000 250,000 8,500,000	1909 1931 1948 1904 1914 1924 1905 1941 1989 1983 1941	M. & S. A. & O. J. & D. J. & D. J. & J. J. & J. J. & J. J. & J. A. & O.	95 107½ 115 128 104 108 115 105 116 115 101 104 112 107	110 116 125 105 110 117 106 117 116	
** All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.  **BOSTON, MASS.**  **Date of Quotation—Jan 15, 1500.  **Lynn & Boston RRlst mtg. g. 5s.  **West End Street RyDeben. g. 5s.  **West End Street RyDeben. g. 4%s.  **\$1,674,000 in escrow to retire outstanding bonds of absorbed companies.  **Charleston S. C.**  **Bate of Quotation—Jan 15, 1500.		2,000,000	1902	M. & S.	114 1043% 112	115	Bleecker St. & Full'n Fer'y RR. Ist mig. 7c Central Crosstown RR	700,000 1,200,000 250,000 800,000 1,1000,000 1,200,000 1,500,000 12,500,000 12,500,000 12,500,000 10	5,181,000 700,000 1,200,000 250,000 800,000 1,100,000 1,200,000 1,500,000 5,000,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000	1945 1900 1902 1922 1908 1982 1914 1914 1915 1998 1997 1909 1909 1922 1919	J. & D. M. & N. J. & J. J. & D. F. & A. F. & A. S. & J. M. & S. F. & A. M. & N. J. & J. J. & J.	109½ 101½ 107 125 101 117 102 108 116½ 89 124 120 120 120 116½	108 109 108 120 105 117 125 121 109 117	
†Enterprise Street RR	500,000 850,000	47,000	1906	J. & J. J. & J	108	::::	Third Avenue RR. lst mig. 5s. Twenty-third Street Ry. lst mtg. 6s. Twenty-third Street Ry. lst mtg. 6s. Union (Huckleberry) Ry. lst mtg. 5s.	150.000	5,000,000	1987 1909 1906	J. & J. J. & J. J. & J.	106	128½ 108 116	
Chicago III.  Date of Quotation—Jan 15, 1900  Ohicago Olity Ry	1,500,000 4,040,000 7,574,000 15,000,000 8,171,000 500,000 2,500,000 4,100,000	600,000 7,500,000 750,000 4,040,000 8,781,200 15,000,000 8,171,000 500,000 2,500,000 2,500,000 8,969,000 700,000	1908 1929 1929 1907 1982 1928 1942 1906 1911 1900 1927 1928 1911	F. & A. J. & D. A. & O. J. & J. J. & J. J. & J. J. & J. J. & J. M. & N. J. & J. J. & J.	1013/4  108/6  96 106  108  101 1065/8	102½4 102 109 96% 111 102 107	ttWestchester Electric RR1st mig. 5s. †\$1,085,000 in escrow to retire gen. mig. bonds.  184,850,000 in escrow to retire maturing obligations.  18552,000 in escrow to retire 1st and 2d mig. bonds. 2In treasury, \$80,000.  It Guar. by Union By. Co.  TOPONIO CANAGA.  Date of Quotation—Jan 15, 1500  Montreal St. By	2,500,000 4,550,000	800,000 2,200,000	1000	M. & S.		114	
†Redeemable at option on 60 da. notice. †Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.  [Subject to call after Oct. 1, 1899, at 110 and interest.  [Assumed by W. Chi. RR. Co., lessee. †Int. guar. by W. Chicago St. RR. Co.  Cincinnati, O.  Date of Quotation—Jan 15, 1500.  Oin. New. & Cov.St. Ry. 1st Con. mtg. g. 5s. 'Mt. Adams & Eden P'k In 1st mtg. 6s. 'Mt. Adams & Eden P'k In 1st mtg. 6s. 'Mt. Adams & Eden P'k In 1st mtg. 6s. So. Cov. & Cin. St. Ry	8,000,000 48,000 100,000 581,000	2,500,000 46,000 100,000 581,000 250,000	1922 1900 1905 1906 1912	,	118 1/4 108 1/4 114 108 1/4 12 1/4 182 1/4	1141/ <sub>4</sub> 104 1221/ <sub>4</sub> 187	Continental Pass. By	800,000 100,000 150,000 250,000 1,125,000 5,698,210 200,000 1,800,000 29,785,000 250,000 2750,000 750,000	810,000 200,000 100,000 100,000 458,000 867,000 200,000 1,018,000 100,000 29,724,876 246,000 750,000	1898 1901 1905 1911 1912 1948 1910 1917 1908 1911 1945 1906	J. & J. J. & J. M. & S. J. & A. F. & A. A. & O. A. & O.			
\$250,000 reserved to retire 1st mig. bds.  Cleveland, O.  Date of Quotation—Jan 15 1500.  Brooklyn Street RR. Co1st mig. 6s. Cln. New't & Cov. St. Ry Cons. mig. 5s. Cleveland City Cable Ry1st. mig. 5s. Cleveland Electric Ry.Co. 1st mig. 5. Columbus (O.) Cent. Ry1st mig. g. 5s. Bast Cleveland RR1st mig. g. 5s. Bast Cleveland RR1st mig. g. 6s. Lorain (O.) Street Ry1st mig. 6s. St. Ry. Co., Grand Rapids1st mig. 5s.  \$1,900,000 in escrow to retire bonds of absorbed companies, marked a. Interest guar. by Cons. St. Ry. Co.	500,000 8,000,000 2,000,000 8,500,000 1,500,000 1,000,000 200,000 600,000	2,500,000 2,000,000 1,249,000 1,500,000 1,000,000	1922 1909 1918 1918 1910 1922 1915	J. & J. M. & S. M. & N.	106}/ <sub>9</sub> 1183/ <sub>2</sub> 105/ <sub>9</sub> 106	107 114½ 106 107 	Pittsburg, Pa.  Date of Quotation—Jan 15 1500.  Birmingham, Knox & Allentown	500,000 875,000 1,250,000 1,600,000 50,000 1,250,000 250,000 1,500,000 1,500,000 1,500,000 2,500,000	500,060 875,000 1,250,000 50,000 1,250,000 750,000 250,000 1,500,000 1,500,000 1,000,000 1,000,000 1,000,000 500,000	1980 1927 1930 1918 1942 1928 1924 1927 1929 1922	A. & O. J. & J. J. & J. J. & J. M. & N. J. & J. A. & O. M. & N. J. & J. A. & O.	110	118	
DetPoit, Mich. Date of Quotation—Jan 15, 1(00. Petroit Citisens' St. Ry	7,000,000 400,000 1,800,000	8,885,000 877,000 1,800,000	1902	A. & O.	105	102½ 106½	Providence R. I.  Date of Quotation—Jan 15, 1100  Newport Street RyOoupon 5s United Trac. & Elec. Colst mig. g. 5s	50,000 9,000,000	50,000		J. & D.	114	118	
New Haven Conn. Date of Quotation—Jan 15, 1500  New Haven St. Ry1st mtg. g, 5s New Haven (Edgewood Div.) lst.mtg.5s. Winchester Avenue RR—lst mtg. g, 5s, Winhester Avenue RRDeben. g, 5s,	600,000 250,000 100,000 100,000	600,000 250,000 500,000 24,000	1914 1912	J&D M&N	111 111 109		St. Louis.  Date of Quotation—Jan 15, 1100  Baden & St. Louis RR	#000 000 2,000,000 2,000,000 1 060 000	250,010 1,900,000 1,500,000 000 000	1912 1907	J&J J&J J&J	102 102 109 %	109 104 × 114 119	

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PASSENGER RAILWAY.									
· NAME.	Amo Authorized.		Due	Interest periods.	M4.	Asked.			
St. Louis.		<u>`                                      </u>	Ī						
Date of Quotation—Jan 15, 1900  Jefferson Avenue By	400,000	400,000	1906	M. & N.	104	105			
Lindell By. Colst mig. 5a Missouri RB. Co	1,000,000	1,500.000 700,000	1911 1916	F. & A. M. & S.	107 105	108 106			
Mound City BB. Colst mig. 68.	125,000	800,000 125,000	1902	A. & O. J. & D.	100	102			
People's RR. Co	75,000 1,000,000 75,000	75.000 800,000 75,000	1902 1904 1905		100	101			
8t. Louis & Sub. Bylst mtg. 5s. §8t. Louis & Sub. Bylst mtg. g. 5s.	2,000,000 2,000,000	2,000,000 1,400,000	1900 1921	M. & N.	99%	1'0% 105			
81. Louis & Sub. KyCons. mtg. 6s.	800,000 500,000	800,000	l	M. & N.	80 105	84 107			
Union Depot RR. Colst cons. mtg. 6s.	500,000 1,091,000	500,000 1,091,000	1918 1900	J. & J. A. & O.	116% 100	118 <b>%</b> 101			
Union Depot RR. CoCons. mtg. 6s. †Controlled by St. Louis RR. Co.	8,500,000	1,787,000	1918	J. & J.	121%	1221/4			
Controlled by Union Depot RR. Co.	) 								
is 200,000 in escrow to retire 1st & 2d mig. 2800,000 in escrow.					٠,				
119700'000 ITI OBCIOM SO IGEITO TES TESPE									
San Francisco Cal.									
Date of Quotation-Jan, 1900. California St. Cable RRist mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117			
† Ferries & Oliff House Bylst mtg. 6s. Geary St., Park & Ocean BBlst. mtg. 5s.	1,000,000	671,000	1921			1.7 95			
†Metropolitan Ry. Colst mtg.	8,000,000 200,000 2,000,000		1918  1918		1263	•••••			
†Omnibus Cable Co	850,000 250,000	850,000	1918 1912 1914	J. & J.	126동 105동 115	107			
†Powell St. Bylst mig. 6s. Sutter St. By. Colst mig. g. 5s.	700,000 1,000,000	700,000	1912	M. & S. M. & N.		125			
†Controlled by Market St. Ry. Co. Washington D. C.						•			
Date of Quotation-Jan 15, 1900.	500 000	450 000	,,,,,,	- 4 -					
Belt By. Co	500,000 500,000 200,000	450,000 500,000 200,000	1914 1911		182	••••			
Metropolitan RR. CoColl tr. cons. 6s. +\$50,000 in escrow to retire 1st mtg.bds.	500,000	500,000		J. & D. J. & J.		•••••			
Miscellaneous.									
Date of Quotation—Jan 15, 1900.  Bridgeport Traction Co1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110			
Bridgeport Traction Colst mtg. 5s. Buffalo (N. Y.) By. CoCons. mtg. 5s. ('tisens' St. B. (Ind'polis) lst cons.m.5s	5,000,000	8,548,000 8,000,000	1981	F. & A. M. & N.	118 104	103			
t Orosstown St. Ry. (Buffalo)ist. mtg.5s. Columbus (O.) St. Rylst cons. g. 5s. Consolidated Traction (N. J.)ist mtg.5s	8,000,000 8,000,000	2,866,000 2,261,000	1982 1982	M. & N. J. & J.	112 115	118			
Consolidated Traction (N. J.)1st mtg.5s  Crosst'n St. By. (Colu's, O.)1st mtg.g.5s Denver City Cable By1st mtg. g. 6s.	2,000,000	18,965,000 572,000	1988	J. & D. J. & D.	1114 115	1113/4 115 <b>/</b> *			
Denver Con. Tram'y CoCon. m. g. be.	4,000,000 4,000,000	8,800,000 922,000	1938	J. & J. A. & O.	20 80	85			
Louisville (Ky.) Rylst cons. mtg. g.5s. Minneapolis St. Rylst cons. mtg. g. 5s +No. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	6,000,000 5,000,000 8,000,000	4,981,000 4,050,000 2,878,000	1919	J. & J. J. & J.	119 110¼	119% 110%			
Minneapolis St. Rylst cons. mtg. g. 5s †No. Hudson Co. Ry. (N. J.). Cons. mtg. 5s No. Hudson Co. Ry. (N. J.). 2d mtg. 5s No. Hudson Co. Ry. (N. J.) Deb. 6s.	550,000	550,000 489,000	1928	J. & J. M. & N.	108	•••••			
Paterson (N. J.) Bylons, mtg. g. os. Mochester (N. Y.) Bylst mtg. 5s.	1,250,000 8,000,000	1,000,000 2,000,000	1981	J. & D. A. & O.		•••••			
84. Paul City RyCons. g. 5s. 84. Paul City RyDeb. g. 6s.	5,500,000 1,000,000	4,298,000 1,000,000			105 1/4 108	106			
†\$1,000,000 in escrow to retire 1st and d mtg. bds.									
13800,000 in treasury. Bonds guar, by Buffalo Ry. Co.					i				
48760,000 in escrow to retire bonds of O. St. RR. Co.									
\$87,000 in treasury. \$960,000 res'ved to redeem prior liens.									
					*With	nt'rest			
ELEOTRIO LIGHT AN	D ELE	OTRIC	AL	. MF	<u>a. o</u>	08,			
Boston, Mass.  Date of Quotation—Jan 15, 1900									
Delaware Gas Lt. Co.,lst m. 5s, g. Edison filec. Illuminating Co., Boston	800,000 2,026,000	800,000		J. & J. Quar.	106 157	•••••			
General Electric Cogold coup, deb. 5s	10,000,000	8,750,000	1922		116	•••••			
Pittsburg Pa Date of Quotation—Jan 15, 1900									
Allegheny County Light Co	500,000 195,570		1911	J. & J. M. & B.	110	•••••			
Miscellaneous.—(Jan 15, 1900.)	4 818 000	4 919 000	1010		109				
Edison El. Illg. Co. (N. York) 1st m. 5s Edison El. Illg. Co. (N. Y.) con. m. g. 5s. Edison Elec. Illg. Co. (Brooklyn)	4,812,000 15,000,000 5,000,000	4,812,000 2,188,000 5,000,000	1910 1998 1940	•••••	124 12234	124			
Edison Electric Light (Philadelphia) Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,000,000 2,500,000	2,500,000	1937	A. & O.	100	103			
Kings Co. El. Lt. & Po. Co. pur. money 6s Milwaukee El. Ry & Lt. Co. lst con. g. 5s.	5,176,000 8,000,000	5,176,000 6,103,000	1997	A & O. F. & A.	120 102} <sub>9</sub>	122			
United Elec. Light & Power Co(N. Y.)	5,000,000		····		••••	••••			
TELEPHONE Miscellaneous.	AND	TELEG	JR)	4 <i>FA</i> .	<del></del>				
Date of Quotation—Jan 15, 1900		ľ	1000		ł				
American Bell Telephone			1898	F. & A.	i'4	115			
Unesapeake & Potomac Teleph. Co5s.	******	•••••	1911	J. & D.	108	106			
ALLIED	INDU	TRIE	s.						
Miscellaneous.  Date of Question—Jan 15, 1900.									
American Electric Heating5s.		<b>5</b> 70 030				25			
Armington & Sims Engine Co	••••••		1942 1904	J. & J J & D.	106	107			
Werthington Pump Co Nomina	75,000					•••••			

## NOTES FOR INVESTORS.

Late quotations for copper are : Electrolytic, 15%@16c.; Lake, 16@16\2c.; casting, 15\2\\@15\2c.

The stockholders of the Harrisburg (Pa.) Traction Company will receive a quarterly dividend of  $1\frac{1}{2}$  per cent.

The Mexican Electric Vehicle Company was incorporated at Trenton, N. J., on January 11 with a capital stock of \$500,000.

The Berliner Gramophone Company of Philadelphia paid on January 12 a dividend of \$1 per share to stock of record January 11.

The General Electric Company will pay a dividend of \$3 59 per share on its preferred stock on January 31 to stockholders of record January 15.

The Citizens Electric Light & Power Co. of St. Louis, Mo., has decided to

issue \$2,000,000 worth of new stock and will enter the electric business.

The stockholders of the Warren Electric and Specialty Company of Warren, O., have decided to increase the capital of the company from \$100,000 to \$200,000.

The Electric Company of America has declared a semi-annual dividend of 50 cents per share, payable January 30. Books close January 20 and reopen January 30.

It is understood that the United Power & Transportation Company has purchased the plant of the Kennett Electric Light, Heat & Power Company in Chester county, Pa.

The committee on securities of the New York Stock Exchange has ruled that transactions in Brooklyn Rapid Transit certificates may be settled by the delivery of the new stock.

The rumor that was current last week to the effect that the Metropolitan Street Railway Company of New York had gotten control of the Third Avenue Railroad Company is denied.

It is reported that Edwin Gould has bought a controlling interest in the General Carriage Company, which will operate electrically propelled cabs and omnibuses in New York City.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 20@23; New York Electric Vehicle Transportation,  $9@@10\frac{1}{2}$ ; New England Transportation,  $6@6\frac{1}{2}$ .

A dispatch from Washington, D. C., states that the Industrial Commission expects to make a report February 1 in regard to trusts. The report will recommend Government supervision similar to that of National banks.

The directors of the Logansport, Rochester & Northern Traction Company of Logansport, Ind., have authorized the issue of \$2,500,000 first mortgage bonds, which will be sold and proceeds applied to building and equipping the line.

There is a strong rumor that Mr. Appleyard, of Boston, president of the Chippewa Valley Electric Bailway Company, has bought the plant and franchise of the Eau Claire (Wis.) Light & Power Company, which is bonded for \$200,000.

The Consolidated Railway Electric Light & Equipment Company, with a capital of \$16,000,000, has been incorporated at Trenton, N. J. The company is empowered to make use of electric light and power and also to manufacture gas.

The Lynn Gas & Electric Company of Lynn, Mass., has voted to increase the capital stock of the company from \$400,000 to \$600,000. The new issue is being made to take care of their floating debt and to provide funds for the erection of a new plant.

Directors of the Chicago Edison Company have voted to issue \$1,000,000 of new stock in accordance with the authorization of the shareholders. The issue will be equal to 20 per cent. of the present capital stock and will be offered at par to stock or record January 25. It is payable February 1.

The 20,000 shares of Erie Telegraph & Telephone Company's treasury stock, offered to stockholders by circular on January 8, will, it is reported, participate in the quarterly dividend, No. 66, of 1½ per cent., which will be declared in the latter part of March, payable the second Monday of April.

The transfer of the control of the Perkins Electric Switch Company of Hartford, Conn., to the Bryant Electric Company of Bridgeport, Conn., has been completed. It is understood the works will remain in Hartford. The price paid for the stock is given out at \$116 for each \$100 share. The capital of the Perkins Company is \$125,000.

The two electric light plants in Kansas City, Mo, have passed into control of the Armours and the men who are associated with them in the ownership of the street car systems of that city. C. F. Holmes, general manager of the Metropolitan Street Railway Company, has been elected president of the two light companies. The two light plants represent about \$1,000,000 invested.

The Harrisburg, Pa., Light, Heat & Power Company will not declare a dividend before April 1, if then. During the year there was a reorganization, the stockholders of the Harrisburg Electric Company disposing of their holdings to the present company, which has just expended about \$70,000 upon a new power plant. A 4 per cent. dividend from the start was expected.

The South Brooklyn Railway Company of Brooklyn was incorporated at Albany, N. Y., on the 13th inst., with a capital of \$150,000, to operate by steam or electricity a railroad twelve miles long, intended for summer travel, from Second avenue, near 39th street, Brooklyn, thence parallel with 39th street to the boundary line between the Eighth and Thirtieth wards, and thence northeasterly to the Kings County line at Liberty avenue in the Twenty-sixth ward.

To determine the best motive power for use on the Boston Elevated Railway, as between the General Electric, Westinghouse and Sprague systems, the elevated company is constructing a shed and two spur tracks in the vacant space inside the North Station loop to be used in making tests with dummy trains in the subway between the hours of midnight and 6 \( \lambda \). M, when the subway is closed to regular traffic. The Manhattan Elevated officials will be represented at the tests.

The New York "News Bureau" says it understands on good authority that the assessment of \$5 per share, due February 15 on Electric Axle stock will be the final call. This payment will make \$10 per share paid in. The company has decided to issue its certificates at a par value of \$10 a share, which will be fully paid in, instead of at a par of \$100, with only \$10 paid in. The stock, as it is now proposed to issue it, will be non-assessable. It is expected that the stock certificates will be ready for delivery between February 15 and March 1 next.

A dispatch from Lyons, N. Y., states that the plant of the Clyde Gas & Electric Company has been taken in charge by Sheriff Wheeler under six judgments aggregating \$1,642, obtained by Syracuse creditors. The stockholders of the company have petitioned Justice Dunwell for voluntary dissolution of the corporation and Justice Dunwell has issued an order to show cause why the corporation should not be dissolved, the order being made returnable February 1. The value of the part is placed at \$71,344; uncollected accounts, \$990; liabilities, \$50,279. The Clyde G.s & Electric Company supply electric light, heat and power as well as steam heat.

Vol. XVIII.

NEW YORK, JANUARY 24, 1900.

No. 3.

# FLECTRICITY

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#### ADVERTISING RATES.

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•	

## EDITORIAL NOTES.

# The Northwestern Electrical Association Convention.

The Eighth Annual Convention of the Northwestern Electrical Association was held on Janu-

ary 17, 18 and 19 at the Hotel Pfister, Milwaukee, Wis.

As usual the papers presented and topics discussed were of a high order and of vital interest to the electrical industry. A former criticism of ours, to the effect that the subjects presented at the meeting of this Society were usually too technical in character, would scarcely apply to the papers presented at the meeting just drawn to a close, for generally speaking most of the subjects were handled in such a way as to be of benefit not only to the theorist, but to the practical worker as well. That the influence of the Society, which embodies the best electrical talent of the Northwest, is spreading, is not to be doubted, for while formerly the interest taken in its Conventions scarcely extended beyond Chicago and neighboring cities, at the present day the papers read and discussions indulged in are looked forward to with interest by electrical workers all over the country.

The social features of the Convention recently held were everything that could be desired. No pains were spared to make the visitors' stay enjoyable—theater parties being indulged in on Wednesday evening, while on Thursday night the customary annual banquet was held.

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Rapid Transit in Sight.

Elsewhere in this issue will be found an illustrated article descriptive of one of the underground

railways of London, which in view of the fact that after some four years of discussion and uncertainty New York City is about to begin the construction of a somewhat similar road, would seem both timely and interesting.

Like all great enterprises, especially those put through by a municipality, the arranging of financial and other matters looking to the construction of a much needed rapid transit system for this city, has been handicapped by an immense amount of red tape. First the city was to build the road as a municipal enterprise and lease the privilege of operating it for a given term of years to the highest respon-

sible bidder. After considerable delay this plan was abandoned, as it was found on investigation that the city was not in a position to issue bonds to the extent of some \$30,000,000. Next a proposition was made looking to the construction of the road with private capital, but after a lengthy discussion the bidder withdrew his proposition owing to the onerous conditions imposed by the Rapid Transit Commission and city authorities. Steps were then taken to have the county debt separated from the city debt, with the result that the municipal fathers were in a position to sanction the issuing of the necessary amount of bonds. Bids were then called for and, as stated in our last issue, two were received. One was \$35,-000,000 the other \$39,300,000. Needless to say the lower bidder's proposition was accepted, with the result that work is actually to begin about the first week of next month.

The building of the underground rapid transit road in this city will undoubtedly prove one of the most gigantic railway undertakings ever attempted in this section of the country. The principal difficulty will lie in the fact that almost 21 miles of road will have to be excavated or tunneled through a soil saturated with water and through which radiate in all directions sewer pipes, water mains, gas pipes, and subways for electrical conductors. Some idea may be had of the immense amount of labor the construction of this underground road will entail when it is stated that a force of 8,000 to 10,000 men will be constantly employed and that even with this army of workmen it will take three years to complete the work.

When the road is in working order the tunnel will be lighted throughout by electric lights sunk into recesses in the walls. To ensure thorough ventilation a system of electrically-driven ventilating fans will be adopted, and as electricity will be made use of for running the trains no trouble will be experienced with smoke or cinders, as was the case in the underground roads of London a few years ago.

The signaling devices will be of the most approved character, and preference will be given to a system which will automatically bring a train to a stop in the event of a motorman failing to obey a danger signal. That a reliable automatic system is of vital importance may be inferred when it is stated that it is proposed to run express trains at a speed of forty miles an hour with a minimum headway of two minutes.

Referring to the fact that increased facilities

for travel usually means an increase in the number of passengers carried, Mr. William Barclay Parsons, chief engineer for the Rapid Transit Commission, is reported as saying:

"The number of 'strap hangers' between here and Harlem will not be diminished by one. The city will grow with the added transit facilities, just as it always has done, and there will be as many to ride on this new road as there will be to ride on the old roads.

"It is true that this new road will be able to carry more passengers than the elevated roads, but there will be more people to carry. The elevated roads are limited to five train cars. In the tunnel we may run as many cars to a train as we like, because there will be nothing to give way under their weight. The cars will be bigger and the trains will be more frequent. The trains in the tunnel can run on forty-five seconds headway for the locals and about two minutes for the express trains. There are no grade crossings or switches to interfere with their movements.

"This will be but the advance guard of the coming extension to South Ferry, and when that has come, and perhaps before, there will be tunnels under the East River to connect with Brooklyn and Staten Island."

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The Advantages of the Metric System of Weights and Measures. At almost every session of Congress during the past half dozen years a bill has been introduced looking to

the adoption of the metric system of weights and measures. The bills have invariably failed to reach a vote, owing to the general laxness of manufacturers and merchants in failing to impress upon their representatives in Washington the importance of sustaining and urging the passage of such a measure. A bill of this nature is again before Congress, making it obligatory on the Government from and after January 1, 1901, in the transaction of all business requiring the use of weights and measurements, except completing the survey of public lands, to employ and use only the weights and measures of the metric system, and prescribing that from January 1, 1902, the metric system of weights and measures shall be the legal standard weights and measures in the United States.

That both England and the United States are seriously handicapped in seeking foreign trade by the system of weights and measures now in vogue there is little doubt, as price lists and catalogues gotten out by English and American firms are necessarily more or less confusing to foreign merchants. That Great Britain appreciates this fact may be inferred from the following paragraph that appeared some time ago in one of our English contemporaries:

"Operations are hampered in many foreign markets, owing to the insistence with which we continue calculating in pounds, shillings and pence, and measuring by yards, feet and inches. Deputations have called upon the Government, and the whole press has filled its columns with advocacy of the metric system. But still the old plan is continued. We understand the first practical step is now being taken in the London Board schools, and at the meeting of the school board recently the school management committee reported the receipt of communications with reference to the adoption of the metric system, which was to a certain extent being taught in the Board schools.

It was resolved to send a memorandum to the department containing proposals for amplifying the teaching of the system by a definite curriculum for each standard."

The principal obstacle in the way of the introduction of the proposed system lies in the attachment of the people to familiar terms, processes and things. They have a definite idea what a pound or a yard means, while they have a very indefinite or uncertain idea of what a kilogram or a meter means, and they fear they never will understand. They are accustomed to the ordinary division into halves and again into quarters; they understand the movement by tens and tenths in numeration and notation, but they are a little dazed by what they suppose is its necessary application to all operations of measurement or weight. In practical life they will undoubtedly use the half kilogram, approximating the pound; the half liter, approximating the pint, and the half meter, approximating the half yard, and very likely the quarters of each, as we do the half and quarter dollars.

Gradually and imperceptibly these designations will fade away as the generation into whose life they have been so thoroughly inwrought fades away, as was the case in Germany and has been the case with our currency system here. Our fathers adhered to the use of their diverse shillings, differing in value in almost every State, but it gradually became in each State a local custom not affecting the general symmetry or general national use of our decimal system, and gradually faded out of use altogether.

The fact that our foreign trade is extending so largely has much to do with the appreciation of the fact that the use of the metric system is desirable. Many of our progressive and enlightened manufacturers, especially in the electrical line, are already prepared for it, and some, who have entered extensively into foreign trade, would welcome it as relieving them from the necessity of keeping double standards and double sets of measures and weights.

A nation ordinarily progressive can not longer afford to linger in the rear of this movement. The metric system, by reason of its decimal scale, its simplicity, its international character, and its unquestionable superiority to any other system of weights and measures, is worthy of universal adoption, and January 1, 1901, the opening of the new century, would be a good time to introduce it in this country.

Attorney General Griggs has advised the Treasury Department that no further proceedings will be directed by the United States in the case of the United States vs. Hugo Reisinger of New York. The question at issue in this case, which was tried before the Circuit Court of Appeals for the Second Circuit, was as to the proper classification for dutiable purposes of carbons for electric lighting. The importer contended that carbons were dutiable at the rate of 90 cents per hundred in the lengths in which imported (36 inches), under paragraph 97 of the present tariff act, as "articles composed of carbon, not specially provided for." The Government contended that the carbons should be assessed for duty at 90 cents per hundred carbons of the extreme length for lighting, viz., 12 inches, under paragraph 98 of the same act. The Government's contention was sustained by the United States Board of General Appraisers, but upon appeal t) the Circuit Court of Appeals for the Second Circuit this decision was reversed, and a verdict given for the importer. The Collector of Customs at New York has been authorized to forward to the Treasury Department the usual certified statement for refund of the duties exacted in excess.

## UNDER THE SEARCHLIGHT.

#### Notes and Comments on Various Topics.

THE two automobile stages which the Fifth Avenue Stage Company of New York City put on its line a short time ago have been a distinct success. Their superior speed and comfort were obvious at first, and the fact that they have not yet had a runaway or breakdown shows that they are quite practicable. At present there are only two in operation, but two more are in process of construction to be put on within a month, and after that others will be added gradually until the old stages have been displaced. The two new motor stages are running between 62d and 4th streets instead of from 88th street to Bleecker street, as do the old horse stages, but even in this distance it is found that about twenty minutes' time is saved each way.

A Lynn (Mass.) paper says that Prof. Elihu Thomson has pending, ready for issue, a patent on what he calls the "sun furnace," which he claims is adaptable to smelting ores and generating heat far intenser than the electric furnace. Metallurgists say that it is well adapted to glass making and manufacturing of carbide. The application made by Prof. Thomson is a wide one, and after carefully studying it at the Patent Office he has been granted a complete novelty. The invention is likely to interest mining men and large smelters of ore.

The Western Electric Company of Chicago has started seventy-two of its operatives for its plant in Belgium for the purpose of teaching native workmen the uses of American machinery and the manner of constructing telephone and other electrical devices after American methods.

Mrs. Mary T. Leiter, wife of L. Z. Leiter of Chicago, has brought suit for a receiver for the Metropolitan Street Railway of Washington, D. C., and to enjoin its transfer to the Washington Traction and Electric Company. She holds 1,270 shares.

Mr. L. F. Cook, the inventor of the Cook elevated electric railway system, which consists of a narrow elevated structure on which cars are suspended on either side, is at present in Milwaukee, Wis., endeavoring to organize a company to construct a mile of road through that city, which if successful it is proposed to ultimately extend to Chicago. The inventor claims that with his system a speed of sixty miles an hour can be attained.

GOVERNOR BRADY of Alaska proposes the use of electricity as a substitute for the cumbersome fire heated iron used in the branding of seals. He claims that if every female seal was electrically branded with the letters "U.S.," four inches in length and half an inch in width, the pelagic sealers' business would soon become so unprofitable that the seal question would be settled, for, argues the projector of the plan, 80 per cent. of the seals illegally killed are females, and the brand would ruin the skin for the use of the prospective furrier. The In-



terior Department is urged to send a force of men, fully equipped for the work, to Alaska and let them take the project in hand. The stockmen of the plains have found electricity to be infinitely more expeditious than the old method, and it would be doubly so with the thin-coated seal. "The branded seals suffer as little from the operation as do quadrupeds," says Governor Brady, "and the introduction of this system will speed the branding, which appears to be the only method by which we can prevent extinction of the species."

A RECENT issue of "Indian Engineering" states that a new telegraph line between Madras and Calcutta has now been practically finished, and that it will be ready for use in a short time. Copper conductors are used entirely for the new line so as to increase its working capacity. The route chosen is via Dhoud and Mannad. A third line will also be constructed to connect up Bombay to these lines. The copper wires along the new route are supported on oil insulators of the Johnson and Phillips type, so as to minimize the effect of the saline atmosphere along the coast.

THE submarine arc lamp, brought out a little over a year ago by Messrs. Hall, Jr., and Burdick, and described in the issue of ELECTRIC-ITY of October 19, 1898, was recently tested in New London, Conn., for the benefit of the Russian Government. An expert diver, who is familiar with deep-sea work, was engaged to conduct the experiments. The arc light was 2,900 candle power, and the power was furnished by the New London Electric Lighting Company by means of a flexible wire cable. The bottom of the river was explored, and by means of the light was discerned clearly. Small objects, which were thrown into deep water, were located quickly, and the experiments were successful in every particular. It is rumored that the Russian Government will order a number of the lamps.

The commissioners of the District of Columbia have received a letter from the mayor of Odessa, Russia, asking to be furnished with copies of contracts between a municipality and companies relative to railways and electric and gas lighting. The Russian pays the District quite a compliment in regard to its management of such matters, and the commissioners will furnish the desired information, together, probably, with a copy of their last annual report.

A SPECIAL cable dispatch to the N. Y. "Sun" from London states that the Secretary of the Wireless Telegraphy Company says that Inventor Marconi will make extensive tests in England in 1900 in behalf of the United States Government, with which negotiations are merely in abevance. Marconi thinks that the present limit of eighty-six miles in communication will shortly be raised to 150 miles. He has no belief in Nicola Tesla's promise to communicate across the Atlantic. He believes that science, while gradually progressing, will be unable to obtain such great results before the preliminary difficulties have been surmounted. Personally, he does not expect, yet, to girdle the Atlantic. Meanwhile, the "Daily News" reports that Emilion Guarini, a native of Puglia, Italy, who is little more than 20 years of age, has discovered a means of utilizing Marconi's invention at the greatest distances. He accomplishes this by means of his own invention, which is called a repeater and which he says receives the electric waves and is capable of transmitting them to other repeaters for continuous repetition. He says he needs a repeater only at every five hundredth mile. He further claims that his invention will enable polar expeditions to keep in constant communication with civilization.

THE electrical congress, held at Como, Italy. the birthplace of the immortal Volta, was marked by many incidents illustrative of the veneration in which the memory of the great Italian electrician is still held by all ranks of people, and not the least by those who cannot possibly understand one iota of his achievements. Some of the visible signs of this feeling were as amusing as they were sincere. The window of a large store would be filled with chocolate boxes made up in the form of "piles," and toy piles would be used to decorate almanacs or serve as pepper boxes. The vogue in handkerchiefs was one of silk in which Volta's portrait was woven, and cheap chromo-lithographs of "Volta discovering the pile" were on sale everywhere. One of the most impressive communications to the congress, which brought together many of the first electricians, physicists and engineers in Europe, was a paper by Senator Blaserna upon the secular changes of the magnetic inclination in the ancient times. He finds that the Etruscan and other urns of burned clay all have inclined magnetic axes of their own, and this he attributes to their having been magnetized by the earth's magnetism at the time of their being fired, thus preserving for centuries a record of the past dip in the terrestrial field. The deduction was drawn that at the date 690 B. C. the magnetic dip in Italy was zero,

WITHIN a few days the new building of the Ottawa Carbide Works will be opened at the Chaudiere Falls, Ottawa. The old structure was badly wrecked, two months ago, by a terrific explosion caused by water running into a super-heated crucible. The new building is entirely fireproof, the only inflammable material in it being the wooden sashes of the window frames. The builders consider that there are few such fire proof structures equalling this on the continent. Subsequent to the explosion referred to, the Civic Committee of Investigation in its report, recommended that in carbide manufacture, the pigs should be cooled in a room separate from the furnaces, and this feature has been followed in all its details. The new plant consists of six large furnaces, double that of the old plant, all of which will be operated. This will give an immense daily output of calcium carbide.

A CABLE dispatch from London states that the British Government Post-Telegraph departments have already contributed to the army in South Africa nearly 500 men, of whom more than 200 were skilled telegraph operators. Reports to the War Office state that the telegraphers are rendering splendid service. It is said that the use of the Wheatstone automatic system on the field of battle is the first in the history of warfare. Moreover, it was worked duplexed, which at the outset was prophesied to be impossible under the rough circumstances of campaigning. At the Modder River the telegraphers were under fire for a whole day. Then they worked through the night on official and press messages. Later, despite the rules limiting the number of correspondents and the length of a message each man can send, the operators sent 100,000 words. The total after the Magersfontein battle was much greater, but the operators got it through without a hitch at the high average speed of about 200 words per minute.

THE many attractions of Waupaca, Wis., as set forth in the following speech by Mr. Lord before the Northwestern Electrical Association, were so enticing as to cause that place to be chosen as the rendezvous for the members next summer: "Inasmuch as it has been decided to hold a summer meeting and the question of place is as yet undetermined, I wish on behalf of the city of Waupaca and the Waupaca Electric Light & Railway Company to extend to you an invitation to hold your summer meeting at Waupaca and the chain of lakes. Waupaca is in the central part of the State of Wisconsin. It is 225 miles from St. Paul and 221 miles from Chicago. It is half way between the eastern and western boundary of the State. The city is a small one of 3,000 people, but four miles from town we have the beautiful chain of lakes known as the Killarneys of Wisconsin. To this point and through the Wisconsin Veterans' Home of Waupaca the Electric Railway line runs. There are several hotels at the chain of lakes, principally the Grand View, which can take care of 250 to 300 guests. They have 12 or 15 cottages around the lakes and there are numerous other cottages. The lakes are 12 in number. They extend from one extremity to the other, a distance of about 12 miles. The shores are thickly studded with timber. The banks are high and dry and boating, bathing and fishing are good. In five minutes time you can walk out into the woods where you cannot be seen and cannot be heard. You can have a royal good time. The facilities of the railway are placed at the disposal of this Association and its friends. You are welcome to everything we can do to give you a good time. Waupaca is a summer resort. Come up and bring your wives and your daughters and your sons. Come yourselves and have a glorious summer meeting and a good time. Come up there and we will be glad to make it pleasant and interesting and give you a summer meeting that you will never regret having."

WE desire to acknowledge the receipt and to express our thanks for a number of handsome and tastefully gotten up calendars received from Alfred F. Moore, manufacturer of insulated electric wire, 200 North Third street, Philadelphia, from the Western Electric Company, New York, and from the Warren Electric & Specialty Company, Warren, O.

The following members were elected at the 201st meeting of the New York Electrical Society, held on the 17th inst: J. L. Kruger and Frank H. Roth, Brooklyn, N. Y.: George H Watson and Joseph Hoffman, New York City.

## Proposals Invited.

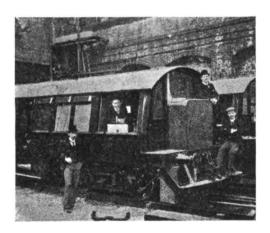
The Supervising Architect of the Treasury Department is inviting sealed proposals until February 10 for all the labor and materials required for fixing in place complete the conduits, electric wiring system, telephone conduits, electric pump, etc., in the U. S. Court House Building at Norfolk, Va. Prospective bidders desiring specifications and drawings may obtain same upon application to James Knox Taylor, Supervising Architect, Washington, D. C.

## AN UNDERGROUND RAILWAY OF LONDON.

In view of the early prospect of an underground electric railway for New York City the following description of the Waterloo & City Electric Railway that has been in operation in London since July, 1898, and for which we are indebted to the "Electrical Review," London, will be found both timely and interesting:

The steam-raising plant consists of five Paxman "Economic" steam boilers, each fitted with a Vicars' patent mechanical stoker, with suitable engine, shafting and pulleys for working the same.

The boilers are 14 feet long x 8 feet diameter and each is fitted with two flues (2 feet 8 inches diameter), and provided with two circulating tubes. There are 92 smoke tubes of 3 inches external diameter. The heating surface is about 1,180 square feet, working pressure 160 lbs. per square inch, hydraulic test 260 lbs. per square inch. Each boiler will evaporate 7,500 lbs. of water per hour. Each flue is provided with Paxman's patent expansion boiler flue, the form of which gives it such strength, that



FRONT VIEW OF MOTOR CAR, SHOWING CAB.

thinner plates can be used in the construction than it would be safe to use in the plain flue. This is a great advantage, as it is a well-known fact that the heat passes more rapidly through thin plates, which are thus rendered more durable, because they do not become overheated. In this way the full excellence of the materials is retained for a great length of time. The strength and durability of a boiler depend greatly on there being proper provision for expansion and contraction. When this is not provided for, furrowing and ripped seams are the inevitable results. Paxman's patent expansion boiler flue provides completely for this, without injuring its efficiency as a stay. The flue is made up of a series of short lengths, which are made of fine, soft and exceedingly tough steel. The plates are bent in such a way as to be when finished perfectly cylindrical, thus adding to the strength of the flue. They are then carefully welded, after which the ends are heated in a suitable furnace and enlarged in a powerful flanging machine in such a way that the end of one plate fits exactly within that of the next; the holes are then drilled through both and riveting completes the work. Both the laps, or doubling of the plates at the seams, as well as the rivet heads are removed from the line of draught and consequently escape the scouring action and intense heat of the gases as they pass along the flue. Flues made on this principle have withstood severe tests most successfully, and the collapsing strength is almost doubled.

The generators consist of six Belliss T.E.C.4 high speed, vertical engines, direct coupled to a two-pole direct current generator of Siemens'

bined sets at full load is 86.7 per cent., and at half load 81.7 per cent.

The train service is conducted almost entirely through twin tunnels, one for the "up" and one for the "down" service. The length



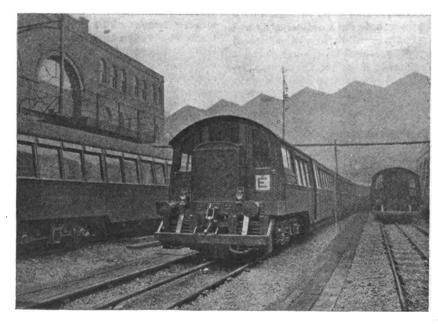
MOTOR BOGIE, SHOWING MOTORS AND COLLECTOR SHOE,

well-known type, each provided with a flywheel weighing about 6 tons.

The engines govern excellently, the momentary variation in speed being less than 4 per

from Waterloo Station to the City station, situated at the end of Cheapside and Queen Victoria street, is 1½ miles.

In regard to the line construction, the steel



ELECTRIC TRAINS IN SIDINGS AT WATERLOO.

cent. when the full load is suddenly taken off, and under 2 per cent. when the full load of 380 amperes is switched on after the set has been running light, the permanent increase of speed from full load to no load is only 0.8 per cent. The efficiency E.H.P. /I.H.P. of the com-

conductor rail, which is of channel section, weighs 39 lbs. per yard, and has a specific electrical resistance equal to eight times that of copper. It is carried on porcelain insulators, which are mounted on iron stalks screwed to the sleepers.

The insulated conductor rail is placed between the two running rails of the permanent way. It is laid in 30 feet lengths, these being connected by copper bonds of 1.5 square inch section, the bond serving the double purpose of fishplate and electrical connector. The copper rivets by which the bonds are attached to the channel steel are expanded into the rivet holes under hydraulic pressure, so that the electrical resistance between the surfaces in contact is negligible.

The running rails, which are used as the return path of the current, are bonded with copper bars of 1 square inch section, which lie outside the fishplates, and are connected with the rails by coned copper rivets in a manner similar to the bonding of the conductor steel.

The feeders and central conductor for the "up" and "down" lines are independent of each other, and accidents occurring on one line (r tunnel do not affect the supply of current to the other. The tunnel lighting is effected by an independent system of feeders and mains while the train lighting is managed from the circuit supplying power to the motors, the track rails being used for the return. A motor carriage is at each end of the train with two trailers between them. The former have collector shoes. There are two four-wheeled bogies to each carriage, and on one bogie of each motor carriage there are two Siemens' series wound motors. The motor armatures were built directly on the driving wheel axles, the field magnets surrounding them being fixed in position, so that they move in a horizontal plane with the bogie, but cannot rotate. No reduction gearing is employed.

Each motor carriage has its driver's cab, shown in one of the accompanying illustrations. Here there are fitted up a Siemens series-parallel controller, brake regulators, an automatic cut-out for 600 amperes, and gauges for indicating the current, voltage, air pressure and speed of the train. The height of the interior of the cab is rather less than that of the passenger coaches, the floor being raised 16 inches to give room for the motor on the bogie below.

The controllers and motors at each end of the train are connected by rubber-insulated cables laid along the roofs of the cars. The coupling used for connecting these cables has 13 distinct sets of contacts, separated from one another by "stabilit" insulators. The two halves of the coupling are bolted together, and pressure is put on the interlacing contact pieces by tightening the screws at the ends of the co inling.

One of our photographic views shows a motor bogie with two motors and collector shoe on the front end. When the photograph was tiken the car was jacked up to allow for the removal of the bogie.

Messrs. Siemens Bros. & Co. were the contractors for the entire electrical equipment of the Waterloo and City line. Mr. D. Heap is the resident electrical engineer at the generating station.

## Telegraphy on the Yukon.

A special dispatch from Skagway to the "Oregonian" of Portland, Ore., states that the first experiment in the far north in winter telegraphy over a modern line is to be watched with interest, now that the Arctic winter is on. Since the advent of the cold season, the wires between Ogilvie and Dawson have been down the greater part of the time. The first time they went down it was more than a week before they were restored. Whether they were

not given slack enough in the summer to al low for construction under the extreme cold, or what is the true cause of the trouble, is not

The receipts of the line the first two months of its operation, October and November, were \$13,000. One day this month \$400 worth of business passed through the Skagway office. Messages of commercial nature come and go not only between the States and Lower Canada, but also Germany, France, Belgium and even New Zealand. So far as possible, connections in the United States are made with the Postal Telegraph system.

The line to Dawson cost \$250,000. Next season it will be connected with the outside world by a line to be built north from Quesnelle, and for which an appropriation of \$350,000 has been made by the Dominion Government. Communication with the outside world will then be reduced to minutes or seconds. Now it requires four or five days for messages to be carried by steamer to Puget Sound after they reach Skagway.

#### THE STEAMSHIP OCEANIC.\*

The steamship Oceanic is at present the largest steamship afloat, having a total length of 704 ft. and a displacement of over 30,000 She has been built and luxuriously fitted for the White Star Company and runs between New York and Liverpool. As may be gathered from the following particulars, the electrical installation of this ocean greyhound is very complete. The generating units are four in number: the engines, which are of the compound twin type, have cylinders eleven and eighteen inches diameter by eleven inches stroke, driving direct dynamos with an output of 100 volts 600 amperes at a speed of 240revolutions per minute. The dynamos are compound wound, of the four-pole type, with two sets of brushes. Absolute steadiness of light has been ensured by exceptionally heavy flywheels. Each dynamo has a capacity for 1,000 16 cp. incandescent lamps, the aggregate of 4,000 lamps being as large as that of many small central stations on shore. Two engines and dynamos are on the starboard and two on the port side, being separated by a central bulkhead. By closing a watertight door in this bulkhead the two compartments can be isolated, so that in an emergency the two pairs can be worked quite independently of each other, thus minimizing the risk of a failure of the entire installation. There are two switchboards, one in each dynamo room, constructed so that one or more of the dynamos can be run in parallel or, if necessary, entirely separate. The power and lighting circuits are connected to separate 'bus bars, rendering it possible to connect one or more dynamos to the power and heating circuits whilst the others run the lamps; or, on the other hand, the power and lighting circuits may be paralleled. In practice it is usual to run the whole day-load in parallel on one or two machines, whilst at night two machines are run in parallel on the lighting and another independently on the power circuits.

All the switches on the boards are of the quick-break type, and the main dynamo switches are provided with auxiliary equalizing contacts to prevent a reversal of polarity. Each board has a voltmeter of the illuminated dial type with volt divisions between 83 and 120 volts, and can be connected by a four-way

switch to either light or power 'bus bars, or to either of two dynamos. There are also four ammeters of Evershed's circular marine pattern reading to 700 amperes, one for each dyna-The ammeters are in circuit with the return cables, which are connected to the ship's hull through massive gun-metal castings bolted to a steel bulkhead. This arrangement has been found advantageous with compound-wound dynamos running in parallel. The main dynamo fuses are of 1 x 0.013 tinned copper, and are covered by hinged plate glass shields. The circuit fuses are of stranded No. 33 tinned copper wire, and their sizes and descriptions of circuits are engraved on corresponding brass name-plates.

The wiring of the ship has been carefully planned to ensure that the lamps in the saloons, libraries, smoke-rooms, emigrants' spaces, and in fact all the principal accommodation, receive current from at least three independent circuits. This arrangement is to guard against total extinction of light should one circuit be put out of action through a main fuse blowing or from any similar cause. One of these circuits runs on the portside, the other on the starboard, and the third feeds police lights, which in small groups remain burning all night when the other lights are switched off. There are 28 circuits in all.

The wiring is carried out on the distribution fuse box system, there being on the different circuits over 100 distribution boxes, some single pole, others double pole; those for the engine rooms are of cast iron, and in the boiler spaces of cast brass, whilst on the decks they are of teak. The boxes for the saloons and the engine room contain, in addition to fuses, switches for controlling groups of lights. The fuses themselves are mounted on detachable porcelain bridges, which can be quickly replaced. There are no isolated fuses. The wiring is on the single wire system and the fittings make "earth" to the skin of the ship through concentric blocks. In the vicinity of the compasses, however, and in the elaborately decorated saloons, where direct attachment to the steel hull is not advisable on account of its inaccessibility, the return cables are taken to double-pole distribution boxes and the 'bus bars connected to the beams by # in. brass terminal screws. Three types of cables have been employed, those in the engine room of vulcanized rubber, lead-covered and armored, having a minimum insulation resistance of 2,500 megohms per mile, and these are clipped to the bulkheads. On exposed decks the cables are lead-covered and braided, whilst elsewhere ordinary vulcanized and braided cables are run in teak casing. The fittings and electroliers generally are of brass, gold-plated, silverplated and bronzed, except in the emigrants' quarters, where they are of cast iron, with massive hinged covers, which are closed when cargo is carried.

The total number of lamps installed is 1,975, of which some 350 are fixed in the engine and boiler rooms, whilst the motors, heaters and other apparatus demand current approximately equal to that taken by the lamps. The illumination of the stained glass domes in the libraries and smoke rooms is effected by inverted 32 cp. incandescent lamps on the principle sometimes adopted with arc lighting.

A large proportion of the first class staterooms on the upper and promenade decks are electrically heated. The radiators absorb from 74 to 10 amperes each at 100 volts, and the switches controlling them have four positions



<sup>\*</sup> From the "Electrician," London.

of contact—viz., one-third, two-thirds, full-heat and off—so that the temperature of any room can be regulated to a nicety by its occupant.

The fan motors are of the enclosed watertight design, direct coupled to centrifugal fans, and move each 11,000 cubic ft, of air per minute at a water pressure of  $\frac{1}{2}$  in. Their output and speed can be varied by means of multiple contact rheostats in series in the armatures.

The stores hoist motor, on the other hand, is of the semi-enclosed type, and is operated by a controller of the construction usually associated with traction work. The motor gears by worms and wheel to a drum, and is reversible in direction of rotation, whilst a magnetic switch cuts off the current automatically when the rope has reached two predetermined positions. Simultaneously it closes a low-resistance circuit across the armature terminals as a brake. The signal lamps are protected by an automatic indicator which, when a lamp burns out, brings into play a second one, at the same time calling the officer's attention to the fact by ringing a bell, lighting a red lamp, and dropping the corresponding indicator shutter.

The fog whistles are actuated by a magnet relay and time mechanism, which causes them to blow for a few seconds at regular intervals. thus avoiding continual personal operation during a fog. These last-named novelties, as are also the cooking apparatus, which comprises griddle cake plates, coffee heaters and hotwater urns, are of American origin. The bell installation includes 1,130 pushes and 15 separate indicators, each so fitted with a singlestroke and trembling bell that either can be switched into action. The single-stroke bell is used at night, and the trembling one during the day. Multiple change-over switches are also employed for transferring groups of rooms from one indicator to another.

## RECENT ADVANCE IN PHYSICAL SCIENCE.\*

BY JOHN TROWBRIDGE, S. D.

Scientific investigation in the department of physics for the year 1898-99, has very little to show that may be considered epoch-making, such as the work of Rayleigh on argon, and the discovery of the X-rays by Roentgen. Nevertheless, there are many interesting developments in mines already opened. The international yacht race has brought forcibly before the American people Marconi's system of wireless telegraphy; and one finds much literature on methods of communicating between stations which are not connected by wires. Marconi has shown that it is perfectly practicable to send messages by the Morse alphabet by means of electric waves over distances of between 30 and 40 miles. These messages are not impeded by fog or bad weather, and the waves apparently pass through hills and through walls of masonry. We say apparently, for it may be that such long electric waves roll around the surface of such obstructions very much as waves of sound and of water would do. It was demonstrated that Marconi's system will prove of use in communicating between ships at sea and between lightships and the shore. It is not yet possible, however, to send the messages in a definite direction, or in other words, to individualize the calls. Every one within the radius of 30 or 40 miles can obtain the wireless messages; and any one by erecting a tall pole,

provided with a wire with simple apparatus for producing electric sparks, could have confused the messages on the occasion of the last vacht race.

The outlook for wireless telegraphy at the close of the year 1899 did not, seem very exten-Until some method is discovered by means of which electric waves can be directed, wireless messages will be of little aid in obviating collisions at sea in a fog: for information in regard to the course on which a vessel is sailing is of no use unless the bearing of the vessel can be determined. This bearing would be given, if the electric waves could be received only in a definite direction. It is said that an English inventor has succeeded in steering a torpedo boat from a distance by means of electric waves. These waves set in action a relay circuit by means of which the rudder is turned in one direction, and when the waves cease, a mechanism reverses its movement. The practical applications of such waves have led to renewed interest in their study. G. V. Maclean, in the Jefferson Physical Labratory of Harvard University, has measured their wavelengths in air, and has determined their velocity (which is almost exactly that of light) to be 180,000 miles a second. It is interesting to reflect that before we hear the crackling sound of lightning, the electric waves excited by the discharge have traveled many hundred miles. One of the desiderata in the subject of electric waves is a more efficient method of producing rapid electrical sparks. The practical method of exciting them at present employed in wireless telegraphy is to suddenly interrupt an electrical current by mechanical means. Great interest has been excited during the year 1899 by a chemical interrupter called the Wehnelt interrupter from the name of the discoverer. It consists of a plate of lead and platinum wire, both immersed in dilute sulphuric acid. An electrical current enters the acid by the wire and leaves by the plate of lead. The bubbles of gas given off from the point of the wire suddenly interrupt the flow of the electrical current for an instant. This interrupter is placed in the primary circuit of a Rhumkorf coil, and a torrent of sparks is produced in the secondary of this coil. The reader will understand that this same Rhumkorf coil consists merely of a coil of coarse wire, through which the electric current flows in an intermittent way, and a coil of fine wire which surrounds the coarse coil. The intermittent action of the current in the coarse coil excites sparks between the ends of the wire of the fine coil. Many papers have appeared on the Wehnelt interrupter and several modifications of it have been suggested. It unfortunately requires considerable energy to set it in action. What is needed in wireless telegraphy is high electromotive force and a quick disturbance of the ether. Some success has been obtained by the use of the Wehnelt interrupter in wireless telegraphy.

The subject of the X-rays is closely connected with that of wireless telegraphy, for it is only another manifestation of electrical impulse or waves. The same energy which is manifested in the form of electrical sparks, and which generates electrical waves sufficient to effect electrical instruments 30 miles from the Rhumkorf coil in which the sparks are excited, is also capable of producing the X-rays in a vessel exhausted of air. While the waves which are instrumental in wireless telegraphy are between 3 and 4 feet long, those that are supposed to characterize the X-rays are less than one one-hundred thousandth inch in length. When

the spark which is competent to excite the long waves of wireless telegraphy is discharged through a rarified space, the peculiar pale yel-" low light of the thus excited Crookes tube appears, and it is no longer possible to send messages to a distance. In place of these messages there is given information in regard to the recesses of the human body, and various molecular movements are called into action which, if properly interpreted, would disclose to us some of the inmost mysteries. The investigation of the X-ray phenomena has not been very active during the year 1898-99. Various attempts have been made to prove that these waves are due to very short waves of light. No one has yet obtained conclusive evidence of this, H. Haga and C. H. Wind believe that the length of the wave is below one one-millionth inch, and M. Maier gives a similar estimate. When we reflect that wavelengths of the luminous portion of the solar spectrum are in the neighborhood of one fiftythousandth inch, we can form some conception of the small size of the waves which penetrate the flesh and throw shadows of the bones.

The practical use of the X-rays has steadily increased, and every hospital now makes use of them to determine the nature of fractures of bones of the extremities of the human body. Unfortunately, not much advance has been made in the use of the rays to study the thicker portions of the human body. The practical range of the rays remains much as it was when Roentgen made his discovery. Skilled observers, however, can now study the progress of disease in the lungs and can investigate the movements of the heart. More use is being made daily of the X-rays in dental surgery. The method employed consists in placing sensitive films, protected from moisture, in the mouth, and in exposing them to the rays which emanate from the Crookes tube situated outside the mouth. X-ray shadows of the teeth and jaw are thus thrown on the sensitive films. Many severe burns have been caused by the exposure of the flesh to the X-rays. The effect seems at first to be like a severe sunburn, but the injury is much deeper seated and the injurious action is progressive; it seems to attack the organs of nutrition of the tissues, and in many cases is very serious. The action can be prevented on the hands by wearing leather gloves or by interposing a sheet of cardboard covered with powdered aluminum which is connected by a wire to the ground. The most surprising development of the X-rays is in the discovery that they are given off by various substances, such as the salts of uranium and certain compounds from pitch blende. These substances have been classed under the name of radioactive substances, and certain of them in the form of powders, strewed on cardboard, can penetrate substances opaque to ordinary light, like wood, thin sheets of metal, etc., and can throw shadows of the bones of the hand on photographic plates. Indeed, they can produce all the phenomena of the X-rays, including the lighting of fluorescent screens, the dissipation of electrical charges, and the rendering of air or gases better conductors of electricity. It would certainly be a strange development in the study of the strange Roentgen light if the costly glass tubes, the induction coils for producing electrical discharges in these tubes, the batteries or dynamo machines should all be discarded, and if simple powders strewn on cardboard should come to suffice for locating bullets in the flesh or determining the nature of the fracture of bones.

<sup>\*</sup> From the "International Monthly," January, 1900,

Although we have not reached yet this praccal development by the study of radio-active substances, we have greatly extended our conception of the nature of radiations, visible and invisible. One of the most mysterious features of the radio-active system is the power to emit the X-rays, without apparent loss of energy. They resemble magnets in exerting an effect without apparent diminution of their original strength. A certain sulphide has been obtained from pitch-blende, which is more than 400 times as active as the uranium earth which was first studied. This sulphide has been called polonium, and it is supposed to be a new metal. It is not characterized by new spectral lines which can be identified. This, however, can also be said of uranium, thorium and tantalum, which give very few lines in their spectrum.

Much interest has been awakened by the production of liquid air on a large scale, and various popular articles have appeared in American magazines describing remarkable experiments which have been performed by the aid of it. The articles have been as remarkable as the experiments, and certain loose statements have led to the hope that liquid air may have a commercial future. These hopes have not yet been realized. The greatest use of liquid air seems to be in scientific investigation; by its aid Prof. Ramsey has added neon and metargon to the list of new gases. These gases were obtained by a species of fractional distillation of liquid air. The residue, after a certain duration of the evaporation, was examined, and in this way the lighter constituents of the air were separated from the heavier.

Spectrum analysis still continues to be a powerful method of investigation. In the hands of Prof. Crookes it has added a new metal to the list, of known metals. Prof. Crookes has called it victorium. The metal was obtained from the rare earth, yttria. In the Jefferson Physical Laboratory of Harvard University, instantaneous spectra of gases have recently been obtained. Formerly it was necessary to expose sensitive plates for several minutes in order to obtain a negative of a gaseous spectrum. It is now possible to obtain such negatives in less than a thousandth of a second. The heat of the electrical discharge which is employed for this purpose is far beyond that previously obtained, and it seems possible to study under very favorable conditions the types of spectra presented by the stars.

Rubens has continued his interesting investigations of the red end of the solar spectrum, and by repeated reflections of heat waves from surfaces of quartz and the mineral sylvine, has succeeded in isolating very long waves of heat. Prof. Langley, who is also continuing his investigations of the red end of the spectrum, has succeeded in rendering his measuring instruments 400 times more sensitive than the form he previously employed. The progress in photography may be said to be in the direction of the red end of the spectrum. The ordinary dry plate is sufficiently sensitive to the blue and violet rays. It is now possible to obtain plates which will also give the red, yellow and green of the spectrum, and the steady improvements in photographic processes leads one to hope that color photography may soon be realized. The increasing perfection of biograph pictures, and the improvement in microscopes, by means of which study of bacilli has been made possible, testify to the advance in the art of making lenses. Prof. Michelson has

described a new spectro-scope for the minute study of portions of the spectrum. It is competent to widely separate lines which seem single into doublets and even triplets—in one sense, to perform the function of a microscope for the spectrum.

The student of light has been much absorbed by investigations of a singular action of magnetism upon light discovered by Zeeman. If the source of light is placed between the poles of a powerful magnet and is examined in the direction of the lines of magnetic force and also in the direction of right angles to these lines-remarkable differences are observed in the character of certain lines in the spectrum of the light. What were considered single lines become doublets and triplets, and a new method of analyzing vibrations of light results from the discovery of this phenomenon. The experiment supports the view of the electro-magnetic nature of light, and the result was predicted by Lorenz from a mathematical discussion of the electrical theory of light. Rhigi has also found that light is absorbed in a peculiar manner when the source is placed between the poles of a magnet. The student, in reviewing the work of the year on the subject of light, can see that the theory that light and heat are electrical phenomena is steadily growing in importance.

The rise in the price of copper has led to renewed interest in the metal aluminum as a substitute for copper, and it is being employed on a large scale. At Niagara Falls, great conductors of aluminum are used to transmit electrical currents from the power house to the works. These conductors are aluminum bars. 25 feet long, 6 inches broad and 1 inch thick; four of these are riveted together at the ends, and each group of bars is connected to aluminum cables: the core of each cable is about 14 inches in diameter. The amount of aluminum in the conductors is 22,000 pounds. The same work in copper would require 48,000 pounds. The conductivity of the aluminum compared with copper is 63 per cent., but for the same weight it is nearly double. Aluminum cables require more insulation, but enable longer spaces to be used, thus reducing the number of poles and insulators. No practical method, however, has been discovered of soldering together bars or wires of this metal, and this fact is a serious obstacle to its rivalry with copper. The size of the cable in telephone circuits would be largely increased if aluminum were employed, and an obstacle would thus be created to the perfect transmission of speech, for the electrical capacity of the line would be greatly enlarged. If aluminum should take the place of copper, most of the tools and mechanical appliances now used for working copper and brass would have to be modified or changed, and this would lead to great expense. Aluminum, however, is much affected by moisture and by the salts contained in water and in soils. It has been discarded in the construction of yachts, especially in those parts liable to be wet by salt water. Attempts have been made to construct storage cells from aluminum in order to take advantage of its lightness, but the results have not been successful. The disintegration of aluminum by liquids seems to be an effectual bar in this direction.

The progress of the practical uses of electricity continues to be a marked feature of the times. This progress is remarkable in the direction of the employment of alternating currents of electricity instead of steady or direct currents. The latter can not be transmitted

without great loss or great expense from one station further than 5 or 6 miles. A to and fro current, on the contrary, can be sent 30 or 40 miles, or even farther, and can be transformed into a direct current at the receiving station. This transformation is necessary at present, for the electric motors on street, railways, are adapted for direct currents. This use of to and fro or alternating currents has led to the utilization of water power on a great scale. During the past year there has been much discussion of this comparatively new field in electrical engineering, and the technical journals have contained many articles on what are called polyphase motors and the transmission of power by their means. The student of the applications of electricity must evidently devote himself assiduously to this new branch of the subject, for it contains far greater possibilities than the old method of direct currents. The subject is a difficult one, both from the side of theory and experiment, and to thoroughly digest the literature which has appeared during the last year on the subject of alternating currents would absorb the entire attention of a competent student. When one reviews the progress of physical science in America one must. follow the practical applications of this science; for the employments of electricity on a large scale bring to light new phenomena or shed powerful light on old ones.

In theoretical physics the most striking hypothesis has been enunicated by Prof. J. J. Thomson on the size of atoms. His remarkable investigation of the action of the X-rays on gases has led him to believe in the existence of masses smaller than the atoms. Several lines of research enabled him to determine the ratio of a mass of the atom to the electrical charge carried by the atom. This ratio was found to be about one-thousandth of that calculated from previous determination by physical chemists on the lines of the old hypothesis of the size of atoms. He therefore investigated the question whether the atom carried an electric charge greater than is reqired by the laws laid down by Faraday, or whether the charge is carried by only a portion of the atom-in other words, whether a small fraction of the atom which carries a negative charge can be separated from its mass. From his experiments Prof. Thomson concludes that ordinary electrification consists in the removal from the atom of a smaller atom or corpuscle negatively charged, leaving the remainder positively charged. Attraction and repulsion merely consist then in a surplus in any point of the mass of an atom, or a deficit. This hypothesis. makes the mass of an atom a variable quantity instead of an invariable one. Prof. Thomson believes that his view is supported by evidences from spectroscopic observation. A careful study of his researches and of those of his students will convince one that the most brilliant work in electricity and the X-rays has been done in England during the year now closed. One is struck, however, by the fact that the X-ray phenomenon has broadened so far as to include the subject of the ultimate constitution of matter.

#### The Ft. Wayne Electric Light Works.

Superintendent J. J. Wood of the Electric Light Works at Ft. Wayne, Ind., recently said that the sales of the factory's product had averged \$17,000 per week from the day the plant was opened up under the new company to the present time. Considering that at first but forty-five men were employed the number being gradually increased, an average of \$17,000 weekly means that since the works have been run with a full force the sales must have been very great. In fact, some weeks the sales aggregated as high as \$28,000. The men at the works are very busy, indeed, and there is a general aspect of prosperity about the plant.

## THE FUTURE OF ELECTRIC ILLU-MINATION.

#### BY JEAN WETMORE.

#### PART IV.

In preceding articles we have briefly reviewed wires, insulation, conduit tubing and the effects of Underwriters' regulations toward producing an increased cost and the complexity of present electrical practice viewed from an independent vantage ground and in the light of future improvements.

We now consider light producers and find that the contest between electricity and gas to be more evenly balanced when all the advantages and disadvantages are considered.

The arc lamp, one of the most efficient and cheapest of electric light producers, must be fed by a heavy No. 6 wire of copper at 164 cents per pound; its light rivals the sun for purity and penetration, but it finds its principal uses restricted to out door work and in lighting large interiors, its machinery is expensive, and complicated to construct, with its main regulating coil, shunt cut out, rods, levers, springs, cogs and clutches, heavy frame and supports and its ever consuming and constantly renewed carbons, that cost money from night to night; then come the repairs and fine adjustments, broken globes to renew and to keep clean.

All these items do not well compare in economy and attention with the refractory mantles over Argand burners, that are coming so plainly in evidence lately in street lighting.

For the smaller more diffused light we have the incandescent lamp, with its yellow, dim light in an often smoky glass bulb, containing often a barely red hot hair pin of fragile filament, of inconstant durability and constantly decreasing efficiency, trying hard to do its duty in an uncertain vacuum.

We can not turn the light up brighter or down lower and save expense.

With this lamp as with the arc it is the whole thing or nothing—no intermediate graduations or house wifely economy.

How do these two classes of electric lamps compare with the brilliant white light of the lately improved refractory mantles, two for twenty cents, that last a year, and a burner that is practically indestructible?

Then there are the improvements that are coming along, such as automatic lighters and no matches used; improved mantles that nearly double the amount of light with the same gas consumption; while we have no improvements in the incandescent glow lamps since the Westinghouse Company used a glass stopple to evade the Edison patents, a mere makeshift with no light producing increase.

Vacuum tubes have so far proved to be practical delusions, and the Nernst lamp has only given some erudite professors an opportunity to make themselves conspicuous by their learned dissertations.

We seem to be at the end of our string, and we are face to face with the fact that the gas

men have been silently stealing a march on us.
What must we do to be saved? Where is the
Moses to lead us out of the wilderness?

When the National Electric Light Convention was held in St. Louis several years ago, we saw glow lamps made to burn without wire connections; has it never occurred to any one to use copper threads and make the idea a tangible commercial fact?

Why confine ourselves to our present heavy amperages, and expensive conductors, to carry a current that will melt anything that it will not consume, and will take human life if one gets in the way of it, when there are other forms of electricity, that produce light and like the biblical burning bush, that burns and is yet not consumed.

We should convert our amperes that are so expensive to carry about into volts that do not have to be carried on or in anything, but would run around without any substantial props, the kind that have millions in them, that are beyond the jurisdiction of the Fire Underwriters, and are life givers and microbe killers, instead of human life takers and insulation requirers.

If properly utilized we have enough scientific facts about these highly attenuated forms of electricity chopped out by our non-practical investigators and posers for notoriety in the Sunday editions of the sensational press, to make the gas people sore afraid, and cause them to be buried in commercial oblivion.

Our great investigators should not spend the hard earned increment of our gullible millionaires trying to send motive power to London or Paris by means of the Aurora Borealis from the summit of Pike's Peak, or fritter away their time teaching the inhabitants of Mars the English language, when we are in need of an electric light that requires no carbon consumption, no machinery, no vacuum surrounded by glass bulbs; but a lamp that produces a white, pure light, without heat, or air consumption and does not require a copper rod as large as a marlin spike to feed it.

Do they not know that the price of copper gas gone up, and that the gas trusts are making the electric men feel melancholy?

(To be continued.)

## American Institute of Electrical Engineers.

The 139th meeting of the Institute will be be held at 12 West 31st street, New York City, this (Wednesday) evening at 8 o'clock, and a paper will be presented by Chas. P. Steinmetz, of Schenectady, entitled "Notes on Single-Phase Induction Motors and the Self-Starting Condenser Motor."

A paper will also be presented by Fitzhugh Townsend, of New York City, on "A New Method of Tracing Alternating Current Curves."

Applications have been received from the following candidates for associate membership, which will be acted upon by the Executive Committee at its meeting February 28:

H. S. McVay, Wichita, Kan. George L. Wiley, New York, Morris M. Menrath, Chicago.

J. L. McCreary, L. W. Henry, C. W. Evans, J. M. Zapata, H. H. Barnes, Mexico City, Mexico.

F. O. Renstrom, Pachuca, Mexico.

M. L. Schiaffino, Guadalajara, Mexico.

A. M. Hunt, San Francisco, Cal.

W. G. Lawrence, Hudson, Mass.

W. Eugene Smith, Philadelphia.

John D. Boyd, Marysville, Cal.

## NORTHWESTERN ELECTRI-CAL ASSOCIATION.

PROCEEDINGS OF THE EIGHTH ANNUAL CONVENTION HELD AT MILWAUKEE.

Fair Attendance and an Interesting Programme-The President's Address—Carcfully Prepared Papers Read and Discussed-Mr. Norcross Elected President.

The Eighth Annual Convention of the Northwestern Electrical Association was held at the Hotel Pfister, Milwaukee, Wis., on January 17, 18 and 19.

FIRST DAY'S SESSION—WEDNESDAY, JAN. 17.
The Convention was called to order at 11 o'clock by the President, Henry L. Doherty.

The minutes of the last Convention were accepted as printed.

The Committee on By-Laws, Prof. D. C. Jackson, chairman, submitted a long report, which was debated at considerable length.

#### President Doherty's Address.

The President then delivered an interesting and lengthy address, in which, referring to the progress made during the last year in central station appliances, he said:

"The progress made in steam and electrical appliances has been all that could be reasonably expected, even though not all that might be desired. The most substantial progress in all lines has been towards the improvement of former developments, by the lessons of experience and better mechanical work. The steam turbine has been Americanized and bids fair to supersede, in a great measure, our present engines. Experimental work has indicated a marked economy of steam consumption with other desirable advantages. American built high speed engines, capable of being directly coupled to arc dynamos, are in successful operation, and steam economy equals most modern multi-expansion engines. The older types of engines have nearly all been greatly improved in detail, and there is a constant tendency for smoother running and better regulation. The exploitation of the electrical business has done much toward the development of steam prac tice. While there have been no marked improvements—except, possibly, for the steam turbine and the higher speed engines-the general operating results have been materially bettered.

"The constant current transformer is here to stay, and street illumination by series alternating enclosed arc lamps seems to be a decided improvement over the old series continuous current open arc. The distribution of light is very materially improved, and the serious objection to the old open arc of lack of uniform illumination has been partially obviated.

"Gas engines are now being built with satisfactory regulation and of any desired size. Two central stations, to the writer's knowledge, have adopted them as prime movers, and have selected sizes as high as 650 B.H.P.

"Aluminum wire is already in satisfactory use as a substitute for copper conductors, and, in view of the inflated price of copper, it would seem advisable to use aluminum as much as possible, to assist in bringing the price of copper to a more reasonable figure.

"The use of exhaust steam for heating neighboring buildings, either by its direct transmission or by the circulation of hot water, is being adopted by numerous plants. The Programme Committee has provided for a care-



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ful consideration of this matter, so I shall not dwell longer on this subject, although one of great importance.

"The distance and high voltage limit of transmission is being constantly increased, and one of the recent plants exploited will transmit current for an extreme distance of 155 miles at 60,000 volts. Two installations will be made during the coming year of 25,000 volt cables underground."

The causes tending to retard development were enumerated as follows:

- "The average central station is handicapped for the following reasons:
- "First—Improper and insufficient education of operators.
  - "Second -Poor accounting.
  - "Third-Lack of capital.
  - "Fourth-Inequitable rates.
- "The ultimatum of perfection in central station operation requires education in all branches of engineering, accounting and business methods. Good judgment and diplomacy are such necessary attributes that their mention here would be superfluous.

"Unfortunately the American people are too easily influenced by the statements of well known men, and read and accept their views without stopping to consider whether they are competent to know whereof they speak. Two well known financiers have, during the past year, stated that the young man of to-day is over-educated, and we now hear much about so-called super-education. I think this idea has taken greater root amongst central station men than any others. All of us cannot follow the vocation of financiering; and what special knowledge do these financiers possess of the needs of other vocations not known to others? Financiering is a profession-if it can be dignified by that term-requiring the same talent as required by a pawnbroker or a country storekeeper, and the testimony of a man with a reputation only as a successful financier should be no more quickly accepted on the merits of education, than on the technique of piano playing. These men unconciously aim to tear down all higher education for the sake of airing an unstudied whim.

"Education, in its broadest meaning, cannot curtail a man's ability; and, if modern education proves harmful, it merely renders present methods questionable, and, in turn, indicates lack of proper education in psychology, pedagogy and kindred sciences on the part of our educators. Public men occupy positions of great responsibility, and the expression of ill-considered ideas is a worse sin than simple indiscretion. True, higher education is the factor which promises to make the American nation supreme, and opposition to education in general dismantles the vehicle of progress.

"Perfection in the electrical business will never be made by following the advice of these accepted oracles, and placing ignorant men in positions of responsibility. Select employes with the usual requisites as to knowledge, truthfulness and judgment; but, by all means, when these talents are equal, choose the most highly educated talent the position will command. I would also recommend further education of present employes. Many correspondence schools are springing up all over the country, and I know some of them are good. The promoters of this method of education are doing a great philanthropic work. They may be unconscious of it, and are, undoubtedly, prompted by personal gain; but, nevertheless, correspondence schools bid fair to do much towards our progress, and have many advantages peculiar to themselves. They reach the man who wants an education, and the man who knows what kind of an education he wants. They reach the man who is probably engaged in the very work he is studying and his education and practical experience gc on simultaneously, and his work is apt to keep him interested in his studies. They place within the reach of all the means to take advantage of the opportunities that are apparent to them."

In concluding, President Doherty referred to the work of the Association in the following words:

"The Northwestern Electrical Association is experiencing a substantial and healthy growth, and is capable of doing much valuable work for the benefit of the central station business. Every central station in the Northwest has and will be benefited to a greater extent than the cost of membership in this Association and the sending of a representative to all of our conventions.

"While our membership is already large, there is no reason why it should not be trebled and an organized and earnest effort should be made this coming year to induce all central stations within our territory to join the Association. When our representatives go before a legislative body or a traffic association, their influence is proportional to the membership they represent; and the larger our membership, the more apt we will be to accomplish whatever reforms are undertaken, and the greater will be our confidence in undertaking new and important work.

"There are numerous other associations, and I sincerely trust that at no distant date a strong effort will be made for a closer relationship between these various associations, which will greatly increase the usefulness of all of them."

Wednesday—Afternoon Session.

The President called the Convention to order at 2:30 P.M.

The Secretary-Treasurer's report was read, accepted and placed on file.

The next order of business was the report of committees, and Mr. Norcross, chairman of the Protective Committee, said: "We have had fair success, but generally not very good, but we did better the last year. I beg to call your attention again to the fact that members of the Legislature paid no attention to whether our plants paid anything at all, the depreciation, income, outgo, etc., it never seemed to enter their heads, and I say nothing against them, but they said, 'Well, we will raise the tax on all electric lighting plants 2 per cent., and they were very much surprised when we asked for a hearing. Our Secretary mailed to each one of them a card or letter suggesting the propriety of giving the representatives of the electric lighting industry in this State a hearing, and to that is largely due the fact of our being given a hearing. I may say without conceit that the members of the different electric lighting stations who were present in Madison, had some influence in getting the Legislature to appoint this committee before whom we could appear or write, and bring to them the knowledge that we were entitled to some notice."

The report of the committee was accepted and placed on file, and the President appointed Messrs. Debell, Hammond, Livermore, Pearce and Frund, as a committee to investigate the matter of taxation and report at the next Convention.

The Secretary then read the following applications for membership:

Joseph M. Brooks, Chicago; Sangamo Electric Co., Springfield, Ill.; E. Kuhlman, Elkhart, Ind.; A. M. Barron, Elkhart, Ind.; Red Wing Gas & Electric Co., Red Wing, Minn.; Ernest H. Davis, Williamsport, Pa.: Varney & McOuat, Indianapolis, Ind.; F. S. Terry Chicago; M. E. Baird, Chicago; Chicago Insulated Wire Co.; S. T. Carnes, Memphis, Tenn.

It was moved, seconded and unanimously carried that the applicants be declared members of the Association, and the Secretary was instructed to cast the ballot of the Association for them, under suspension of rules, which was done.

Mr. R. Fleming, of Lynn, Mass., then read his paper on "Modern Development in A. C. Series Arc Lamps."

The paper was carefully prepared and elicited the remark from the President "that the subject is perhaps as interesting to central stations as any matter that could be brought up at this Convention."

On motion of Mr. Bean a vote of thanks was extended to the reader of the paper.

Prof. Jackson of Wisconsin University then read his paper on "Alternating Current Phenomena."

At the conclusion of the reading of his paper Prof. Jackson said: "Power factor can never be more than unity, because it makes no difference whether the current wave is in advance of or behind the pressure; we have still the volt errors, which if there is any difference of phase, are bound to be larger than the watt meter unit. So the power factor will always be unity or less."

The President—I expected that this paper by Prof. Jackson would contain a simple exposition of the subject, but a few Greek letters may have scared off some members who are not mathematical. But I had a chance to look this paper over, and it is really not hard to follow, but whether hard or not it is the easiest thing to follow I have ever seen on this subject, and it embraces some information that every alternating station man ought to know.

On motion a vote of thanks was extended to the speaker and the paper ordered published.

The President appointed as Committee on Nominations, Messrs. Copeland, Bragg, Kerns, Bean and Kountz; as Committee on Summer Meeting, Messrs. Lord, Frund, Gille, Bean and Kountz.

An adjournment was then taken to 10 A.M. January 18.

Second Day's Session—Friday, Jan. 18.
The Convention was called to order by the

The Convention was called to order by the President at 10 A. M.

A paper on the subject of "Central Station Heating in Connection With Electric Lighting Plants" was read by Mr. W. H. Schott, of Chicago.

President Doherty remarked that the paper read by Mr. Schott was of such importance that it should be thoroughly considered, and almost all the members participated in the discussion.

A paper was then read by Mr. W. H. Frund on "Central Station Economies," and like the preceding paper was found so important that nearly the entire morning was taken up with the discussion.

Just before adjournment at noon Mr. Mershon read a paper on "The Induction Motor." At the conclusion of his paper Mr. Mershon said: "As long as there is any relative difference of speed between disk and magnet, elec-

tromotive force will be generated and the current will flow in the elementary circuits shown. The question of power factor is not very complex, if you simply consider it as a ratio between the true power supplied through any piece of apparatus and the apparent power. The analogy between the static transformer and the induction motor is a complete one. We have the magnetic current of induction in the one corresponding to the magnetic action in the other; the action and reaction between the primary and the secondary are the same, and the drop is also the same."

An adjournment was then taken until 2 P.M. THURSDAY-AFTERNOON SESSION.

President Doherty called the Convention to order at 3 P.M., and the order of business of the election of officers was called for.

The Committee on Nomination of Officers recommended that the following be elected:

President-P. Norcross, of Janesville, Wis. First Vice-President-H. W. Frund, of Vin-

cennes, Ind. Second Vice-President-H. J. Gille, of St. Paul, Minn.

Secretary and Treasurer-Thomas R. Mer-

Directors-H. W. Schott, George D. Westover and Mr. Imass.

Mr. Livermore moved that the nominees of the committee be elected to the respective offices for which they are nominated, that the rules be suspended, and that the Secretary cast the ballot of the Association for them.

The Secretary cast the ballot as instructed, and the President announced that the nominees were duly elected to their respective offices.

The President-I request Col, Copeland and Mr. George Cutter to escort President Norcross to the chair and introduce him, if he needs it.

This was done amid great applause,

President Norcross-Gentlemen of the Northwestern Electrical Association. For a number of years last past this Association with rare good sense has selected for its Treasurer and Secretary one man who collects all the bills, pays all the debts, does all the advertising, duly advises us whenever a meeting is to be held, looks out for our comfort during the summer as well as the winter. Now, with such a Secretary and Treasurer I apprehend that notwithstanding my predecessor has spent a considerable amount of money, which I think he ought not to have done, that the office of president is to a considerable degree ornamental, though I count it no small honor to be selected as your presiding officer for the ensuing year, and I beg to extend to you my most hearty thanks for that honor.

Waupaca, Wis., and St. Paul, Minn., were the cities advocated for holding the summer meeting, and Waupaca was selected by a vote of 42 to 12.

It was decided that a committee of four, of which Mr. Lord of Waupaca is chairman, have the power for selecting the date for holding the midsummer meeting.

On motion of Prof. Jackson a committee of three was appointed to report a year hence upon the possibilities and advantages of central station companies taking an interest in the entering of their employes upon the courses in correspondence schools.

Prof. Richter of the University of Wisconsin then read a paper on "Relative Desirabil-'ity of Various Types of Engines on Central Station Loads,"

Mr. Marsh, in the absence of Prof. Shepardson of the University of Minnesota, read a paper by Prof. Shepardson on " $\Lambda$  Life Test of Incandescent Lamps."

The paper on the subject "A Canadian Plant," by L. G. Van Ness, of Quebec, Canada, was not presented.

An adjournment was then taken to Friday.

THIRD DAY'S SESSION-FRIDAY, JAN. 19.

The Convention was called to order by the President at 10 A. M., and there being no business before the meeting the Convention then on motion adjourned.

#### PERSONAL MENTION.

Mr. Adolph Theobald has been elected president of the Edison Electric Light Company at Columbus, O.

Mr. Marshall L. Barnes, an Alderman of Troy, has been elected vice-president of the New York State Association of Electrical Contractors.

Mr. Fenner VanAuken, of Allegan, Mich., has received an appointment to the United States Navy as an electrician. He served as first lieutenant of the Thirty-fourth Michigan in the Spanish-American war.

Prof. W.F. Durand of Cornell University has been awarded the first prize for the best technical essay submitted to the American Society of Naval Engineers for his paper on "Electrical Propulsion for Torpedo Boats." The prize consists of a substantial compensation, life membership in the society and a gold medal.

Mr. Frank C. Tryon, Jr., superintendent of the Huntington Electric Railway, died at his home in Huntington, L. I., January 15. He was twenty years of age, a native of New York, and one of the youngest men in the country to occupy so important a position.

#### INCORPORATIONS.

The International Commercial Incandescent Light Company, Allentown, Pa. Capital stock, \$200,000.

The National Power Company, Kittery, Me. ture and distribute electrical power. Capital stock, \$1,000,-000. President, W. E. Taft of Boston, Mass.; treasurer, F. E. Rowell of Kittery.

The Sussex County Gas Company, Newton, N. J.-to do a gas and electricity business. Capital stock, \$75,000. Incorporators: J. H. Avery, O. Congleton, both of New York, and H. G. C. Thompson, of Cranford.

The Kidder Motor Vehicle Company, New Haven, Conn. Capital stock, \$500,000. Officers: President, T. Attwater Barnes; vice-president, Hon. C. C. Colby; secretary. F. G. P. Barnes; treasurer and general manager, Charles R Bishop; consulting engineer, Wellington P. Kidder.

The Morgan Electrical Machine Company, Chicago, Ill.—to manufacture electrical goods. Capital stock. \$25,000. Incorporators: E. C. Morgan, D. B. Douglass and J. H. Barnard, all of Chicago.

#### COMMERCIAL PARAGRAPHS.

Mr. Oscar A. Michel, the well-known patent expert, whose offices in this city have heretofore been at 305-309 Broadway, has removed to more commodious quarters in the Vincent Building, 302-304 Broadway. How successful Mr. Michel has JULIUS E. SEITZ.
PRESIDENT & TREASURES.

## ELECTRICAL PATENT RECORD.

This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FORBIGN PATENTS, at 303 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U.S. Patent Office for more than Afteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.

#### LETTERS PATE YT ISSUED JANUARY 16, 1900.

#### ELECTRIC RAILWAYS AND APPLIANCES.

ELECTRIC RAILWAYS AND APPLIANCES.

641,264. Contact-Box for Electric Tramways. Edouard Bonnet, Jules Paufique and Georges Liniere, Lyons, France. Filed June 16, 1809.

641,871. Trolley-Arrester. William E. Carlile, New York City. assignor to himself and Edward N. Dickerson, same place. Filed May 27, 1809.

641,883. Trolley-Catcher. Hugh W. Graham, Louisville, Ky. Filed Nov. 15, 1809.

641,486. Car-Fender. Joseph W. Cramer. Kansas City. Kan., assignor of one-half to Theodore O. Cramer, same place. Filed Nov. 2, 1806.

#### ELECTRIC LIGHTS AND APPLIANCES.

641,463. Portable Electric Lamp. Hermann J. Muller, New York City. Filed April 27, 1899.
641,613. Shade for Electric Lights. Walton D. Smith. Prophetstown, Ill., assignor of one half to William McNeill, same place. Filed Aug. 1, 1899.

#### ELECTRICAL MACHINERY AND APPARATUS.

ELECTRICAL MACHINERY AND APPARATUS.
 641,257. Electrical Controlling Device. Henry P. Ball, New York City, assignor to the Ward Leonard Electric Company, Hoboken, N. J. Filed Oct. 24, 1896.
 641,452. Means for Controlling Electric Motors. Rudolph M. Hunter, Philadelphia, Pa. Filed Jan. 16, 1894.
 641,453. Method of Controlling Electric-Motors. Rudolph M. Hunter, Philadelphia, Pa. Original application filed Jan. 16, 1894. Divided and this application filed Nov. 9, 1899.
 641,607. Electricity-Meter. Paul Kissler and Heinrich Bauer, Freudenstadt, Germany. Filed Nov. 18, 1899.

## TELEPHONES AND TELEPHONE APPARATUS.

641,373. Telephone-Switchboard. Frank B. Cook, Chicago, Ill. Filed Feb 8, 1838.
641,400. Connection-Counter for Telephone-Lines. Frank R. McBerty. Downer's Grove, Ill., assignor to the Western Electric Company, Chicago, Ill. Filed Jan. 9, 1897.
641,569. Telephone Apparatus. David H. Wilson, Chicago, Ill., assignor to Jay Morton, same place. Filed Jan. 29, 1898.

641,570. Telephone. David H. Wilson. Chlcago, Ill., assignor to Jay Morton. same place. Filed Jan. 20, 1899.
641,693. Telephone. Abbot A. Low, New York City. Filed Feb. 5, 1898.

## MISCELLANEOUS.

MISCELLANEOUS.

641,806. Electric Water-Heater. Arthur W. Lawton, New York City. Filed April 6, 1899.

641,809. Coin-Controlled Electric Battery. Adolph Linick, Chicago, Ill. Filed April 15, 1899.

641,322. Method of Regulating Electric Circuits. Mathias Pfatischer. Philadelphia, Pa Filed July 7, 1899.

641,369. Electric Amalgamator. Louis H. Barricks, San Francisco, Cal. Filed Oct. 2, 1899.

641,374. Combined Terminal Head and Junction Box. Frank B. Cook, Chicago, Ill. Filed Feb. 26, 1838. Renewed Nov. 29, 1899.

641,382. Electric Lock. Levi Goughenour and Charles B, McCabe. Braddock. Pa. Filed Feb. 7, 1899.

644,412. System of Electric Circuits and Brakes for Vehicles. Elmer A. Sperry, Cleveland, O. Filed Sept. 16, 1899.

httes. Eimer A. Sperry, Cleveland, O. Faled aspr. 16, 1899.
641,438. Electrolytic Apparatus. James D. Darling, Philadelphia, Pa., assignor to the Harrison Bros. & Co., Incorporated, same place. Filed March 27, 1899.
641,603. Electrically-Propelled Vehicle. Frederick J. New-

8. MESSERER. SECRETION & PIRADER

MESSERER AUTOMOBILE CO.

Neural N & January 8 . 1900

Mr Oscar a Michel. Dear For Your letter will notice of allowance of Talent on Automobiles has been duty roceived, and we are highly pleased with your par careful work, you have done for us. We shall therefully recommend you do anyone inderested in Palents

Yours very only Messenes autmobil Emp I Museu many

been in obtaining patents may readily be inferred from the above letter.  $% \left( 1\right) =\left( 1\right) \left( 

man and Joseph Ledwinka, Chicago, Ill. Filed Sept. 1,



## GENERAL NEWS.

#### What is Going On in the Electrical World.

#### LIGHTING.

Alliance, O.—An electric light plant will soon be erected here.

Avon, N. Y.—At the annual meeting of the stock-holders of the Avon electric light plant it was decided to enlarge the plant.

Bedford, Pa.—The council has started a movement that may result in the adoption of electric are lights for street lighting.

Bloomfield, Conn.—It is safe to say that this village will have an electric light plant, despite the opposition by some of the citizens.

Braintree, Mass.—This town has appropriated \$26,000 for the purpose of remodeling the electric light plant.

Camden, Ill.—The village board has voted to put in an electric light plant.

Charlottesville, Va.—The Virginia Ice Company of which T. O. Troy is president contemplates the erection of an electric light plant at this place.

Clementon, N. J.—A census is being taken of the property holders of the town to determine how many would like to put electric lights in their houses, and also to find out what can be done about lighting the streets with the same

Cottonwood Falls, Kan.—Strong City and this place are to have electric lights and electric car lines.

Evanston, Ill.—The scheme of utilizing the surplus power at the waterworks for city lighting has met with approval by the aldermen. The committee on lights and lighting are to report to the city council not later than the second meeting in February concerning the fessibility of establishing a municipal lighting plant.

Eufaula, Ala.—J. W. Spencer has been instructed by the city council to investigate the cost of building and operating an electric light plant.

Friend, Neb.—The citizens of this place are agitating the question of building an electric light plant

Glenville, Neb.—The electric light plant at this place has been destroyed by fire, entailing a loss of several thousand dollars.

Hellertown, Pa.-The Thomas Iron Company has decided to put up an electric light plant at its two large furnaces and to light the buildings inside and outside by electricity.

Homer, Mich.—The village council has decided in favor of municipal ownership of the electric lighting

La Grange, Ga.—This city will hold an election February 1 to determine the issuance of \$15,000 of bonds for erecting an electric light plant.

Laurens, S. C.—The Laurens Laundry Company will soon install an electric light plant of about 20 lights and wants estimates, etc., from manufacturers.

Lostant, Ill.—This city contemplates erecting an electric light plant

electric light plant.

Madison, Ark.—J. W. Wheeler & Co. contemplate building an electric light plant at this place.

Malvern, Pa.—A project has been started to erect an electric light plant in this place.

McKinney, Tex.—The citizens are agitating the question of erecting a new electric light plant.

Monticello, Ark.—Bids will be received until February 10 by R. L. Hardy, secretary of the board of improvements in district No. 1, for constructing a complete system of electric lights.

North Wilkesboro, N. C.—This city has voted bonds for an electric light plant. Address L. Vyne.

Owensborough, Ky.—It is reported that the new city council will at once begin consideration of the electric light question, and a proposition will shortly be made for the erection of a municipal plant.

Port Washington, N. Y.—A stock company is to be organised here for the purpose of establishing an electric lighting plant.

Shamokin, Pa.—The citizens are contemplating the building of a municipal electric light plant.

Tate Springs, Tenn.—A large electric light and heating plant costing \$15,000 will soon be erected here.

Toocle, Utah.—McBride & Orme Brothers wish to increase the water power that they already have, with the intention of putting in an electric light plant, and supplying the town and surrounding country with better and cheaper light.

Union City, Mich.—The city council is discussing the matter of building a new electric light plant.

Webb City, Mo.—A subscription paper has been in circulation for the purpose of building a consumers' light plant. It is proposed that the citizens take stock and erect a plant, the city having the right to purchase it at any time. it at any time.

Westerly, R. I.—Messrs. Arnold, Price and Haswell, have been investigating the question of a town electric lighting plant. Plans are in preparation for a town lighting station.

#### STREET RAILWAYS.

Akron, O.—The long projected line between this city and Canton will be constructed next summer. W. A. Lynch, of Canton, is at the head of the project.

Branford, Conn.—The new electric line for this place is about to become a reality. Work will be begun early in the spring. The route will be by the shore. The terminal is to be at the power house in Mill Plain.

Collinsville, Ill.—The surveyors for the new electric railroad have lately been working near this city. The coad will be completed and everything in working

order by spring.

De Kalb, Ill.—The city council has granted a franchise to the Sycamore-DeKalb Electric Railway Company.

East Liverpool, O.—The scheme to construct a traction line from Beaver, Pa., to this place has been started. A company has been formed composed of H. C. Eagle, H. W. Reeves and C. E. Deens, of Beaver, who have applied for a charter to build the line. The capital will be \$75,000. The road will connect with the Beaver Valley Traction Company's lines at Vanport, Pa., and extend down the Ohio River to Wellsville, O., a distance of 23 miles.

Elkton, Md.—A project is on foot to have an electric allway between here and Chesapeake City.

Greenfield, Mass.—A movement has been started to build an electric railroad from here to South Deerfield, a distance of nine miles. John A. Taggart, Charles H. Keith, John Sheldon, Clifton L. Field, E. H. Hollister and D. P. Abercrombie, Jr., of Greenfield, are interested.

Houston, Tex.—The Houston-Oakland & Magnolia Park Railway Company has decided to rebuild its line for the use of trolley motors. A. Fuller is general manager.

Jersey City, N. J.—David Young, president of the Jersey City, Hoboken & Paterson Street Railway Company, says the company has been considering a plan to enter Hackensack from Lodi, in a northeasterly direction.

Kenosha, Wis.—Prospectors are laying out a line for an electric road between here and Waukegan.

Millville, N. J.—The Millville Traction Company has made application to the city council for permission to extend its line to Vineland.

Newport News, Va.-The Hampton Roads Railway & Electric Company proposes to build an electric railway from this place to Hampton and Old Point. A. H. Martin, W. J. Holms, R. W. Shield, C. F. Day and others are interested.

Schuvlersville. N. Y.-Surveyors have been looking electric railroad route between here and For The road is promised in the early summer.

St. Louis, Mo.—Special electric fureral cars to carry the dead, the mourning friends, the family and pallbearers to the cometery are to be introduced in this city. The St. Louis Funeral Transportation Company is the author of this innovation.

Tamaqua, Pa.—The Schuylkill Valley Electric Railway Company has received the right of way to build its line from this place to Port Clinton. Pottsville is the objective point. Work will be started early in the

## COMPANY MATTERS.

Bennington, Vt.-The Bennington & Hoosick Valley Electric Railway Company is about to erect a new power house, which will be placed on the banks of the Walloomsac River.

Cleveland, O .- The Little Consolidated Street Railway Company will build a \$40,000 car house next spring with a capacity of several hundred cars.

Charlestown, Md.—The Charlestown Electric Light Power plant has been sold to C. E. Ehrehart, of Han-& Power plant has be over, Pa., for \$10,150.

Columbus, O.—The People's Gas & E'ectric Company has increased its capital stock from \$50,000 to \$100,000.

Holland, Mich.—The car barn, eleven cars, and the freight motor of the Holland & Lake Michigan Electric Railway Company were lately destroyed by fire. Las,

Kansas City, Mo.—The new owners of the Edison Electric Light & Power Company of this city, will spend more than \$500,000 in improvements.

Lebanon, Pa.—The Edison Electric Illuminating Company of this place has received 175 street lamps of the highest candle power. The company will now rethe highest candle power. The company will now build its plant and add two large compound boilers.

Lonisville, Ky.—The plant of the Glasgow Electric Light & Power Company will be resold on the 19th of February, the former sale raving been set saide at the late term of the Barren Circuit Court because of the inadequacy of price it brought and inefficiency of advirtising.

Menominee, Mich—The electric light plant at the Ludington, Wells & Van Schaick Company's mill has been wrecked by the bursting of a fly wheel.

Merchantville, N. J.—There is a scheme on foot to consolidate all the gaslight and electric light companies in West Jersey. A large plant will probably be built in this place.

Muskegon, Mich.—The Shaw Electric Crane Company of this city will erect a new pattern shop and

storehouse adjoining their plant. The pattern shop will be built by the company

New Market, N. H.—The Newmarket Electric Light, Heat & Power Company has filed notice with the Sec-retary of State for an increase in its capital stock to \$10,000.

New York.-Plans have been filed with Building New York.—Plans have been filed with Building Commissioner Brady for the Edison Electric Illuminating Company's power-house, taking in the entire block between 38th and 39th streets, First avenue and the East River. It will be three stories, high, of steel skeleton construction, and cost \$809,000. The plant will include sixteen engines, which will operate at best economy when indicating 5,200 horse-power. Each engine will be capable of 8,000 horse-power, making the maximum capacity of the plant 128,000 horse-power.

Rockville, Ind.—The Rockville Electric Light & Power Company is now owned by Rockville capitalists.

Toledo, O.—The Toledo Traction Company has plans prepared for improvements to be made this year that will cost \$180,000. It is proposed to enlarge the power-creating facilities in the way of boilers, engines, etc.

#### MANUFACTURING, ETC.

Ft. Wayne, Ind.—The Fort Wayne Electric Company has the contract to put in a lighting plant at Morella, Mexico, and has already shipped a part of the machin-

Munising, Mich. -A new boiler and engine will be installed at the electric light power hous

Troy, N. Y.—The contract for installing an electric lighting plant in the works of the American Steel & Wire Company at Crown Point, N. Y., has been awarded to Philip S. Dorlon of this city.

Warren, O.—The New York & Ohio Electric Company of this city has been awarded the contract for furnishing the incandescent lights on the United States Government Building at the Paris Exposition.

#### POWER AND TRANSMISSION PLANTS,

Hoosick Falls, N. Y.—The Bennington & Hoosick Valley Railway Company is to have a power plant of its ewn. The company has bought a plot of ground and will erect a brick building 50 x 100 ft. Orders have been given for a cross compound condensing Corliss engine of 300 horse power, two Heine water tubes and a Westinghouse generator. The plant will be thoroughly equipped and will be in operation by May 15.

Niles, Mich — Representatives of the Michigan-Indiana Street Bailway Company have consummated a deal whereby the company agreed to pay \$10,000 for the privilege of constructing a dam at Berrien Springs across the St. Joe River at that place. The power to be derived from it is to be utilized for electric purposes. It is the intention of the company to build an electric street railway from South Bend through Niles and Berrien Springs to Benton Harbor.

Owatonna, Minn.—The city council has granted a franchise to the Owatonna Light, Heat & Power Company, permitting it to build a plant in this city.

Phoenix, Ariz.—Within six months Phoenix is to be supplied with electricity generated by water power 22 miles east of the city.

## MINES, ETC.

Twin Lakes, Col.—J. H. Brown, owner of the Gordon mine, is reported as saying that "there is an enormous mine, is reported as saying that "there is an enormous amount of power now going to waste in the Arkansas River and its tributaries that should be used in the generation of electricity for mining operations. There are several streams in this vicinity which could be harnessed to supply an immense amount of power, and I believe that it is one of the best fields for the investment of capital now open in Colorado."

Virginia City, Nev.—Leon M. Hall, who was re-cently appointed as consulting electrical engineer by cently appointed as consulting electrical engineer by the mining companies composing the Comstock Pump-ing Association, has been visiting this city and Gold Hill, for the purpose of inspecting the machinery of the various mines on the lode and will report on what can be adapted to electrical power and what will have to be discarded. His report will be an important one, and must be in the hands of the companies before they can begin preparations for the new order of things.

#### AUTOMOBILES.

Chicago, Ill.—This city is agitated over a resolution just introduced in its municipal parliament requiring fenders to be placed on automobiles used for rassenger or freignt purposes, and providing penalties ranging from \$25 to \$100 for violations of the ordinance.

New Haven, Conn.—The Kidder Auto Vehicle Company which has just been organized with a capital of \$500,000, has taken the first step toward locating in this city by leasing the larger part of the old New Haven Chair Company's plant on Audubon street. Work on orders received will commence immediately and it is expected that the first results in manufactured articles will be put on the market by the first of the spring. spring.

Washington, D. C.—It has been reported that the Washington Electric Vehicle Company, the local off-shoot of the New York Electric Vehicle Company and other concerns having the Columbian electric automotive reports in about to begin humans. bile patents, is about to begin business.



## THE TELEPHONE WORLD.

#### The Chicago Telephone Company.

Stockholders of the Chicago Telephone Company, over 41,500 shares out of a total of 50,000 being represented at the meeting, unanimously approved the proposition to increase the authorized capital stock from \$5,000,000 to \$15,000,000, the additional \$10,000,000 to be issued from time to time as may be needed for improving and extending the plant. Chauncey Keep was elected a director to succeed the late Norman Williams.

The financial statement showed an increase in gross earnings of \$360,705, or 15.6 per cent, as compared with 1898, against an increase of 11.3 per cent, last year, 5.94 per cent, in 1897, and 11.1 per cent, in 1896. The net earnings of \$676,559 were the largest in the history of the company, and notwithstanding the increase in the dividend requirement resulting from the issuance of \$663,500 new stock during the year, the surplus for the year increased \$3.427.

At the annual meeting of the Fairmont Telephone Company, of Fairmont, Minn., referred to in last week's issue of ELECTRICITY, a change was made in the articles of incorporation as follows: Capital stock raised from \$25,000 to \$100,000, and limit of indebtedness raised from \$3,000 to \$5,000. The company now has a line to Heron Lake, with stations at all intermediate points to Armstrong south via East Chain, Centre Chain and Wilbert, north to Truman, Lewisville and Madelia. The company owns a franchise at Madelia, and will put in an exchange at that place in the spring. They ontemplate extending a line direct to Blue Earth along the Northwestern road and also along the Burt-Sanborn line and the M. and St. L. from St. James to Estherville, and have direct connections with every town in the county. The line now connects with the Northwestern at Madelia and Heron Lake and with the Western Electric at Armstrong, giving good communication service all over the Northwest. The old board of directors were elected for another year as follows: W. W. Ward, P. R. Matson, Cecil Sharpe, Elmore Houghtaling and A. H. Smith. Immediately after adjournment the oard met and elected W. W. Ward president, P. R. Matson vice-president, and D. S. Wade secretary-treasurer for the ensuing year.

Mr. William L. Holmes, president of the People's Telephone Company of New Orleans, La., referring to the achievements of the company is reported as saying: October a year ago we began work here and in the fifteen months intervening we have established ourselves completely, put in underground conduits, put in an elaborate exchange and have now in operation about 3,000 telephones. There are still some districts of the city we have not yet reached and now have applications on file for over a thousand 'phones, which we expect to have in operation within a short time. It is my confident belief that by the end of the present year we will have 6,000 telephones in working order and within the next two or three years our list of subscribers will number 10,000. It is all a matter of educating the people up to the usefulness of the telephone. It will be remembered that only a few months ago the number of telephones in use here was comparatively very small. The people had never used the 'phone to any great extent, consequently did not feel the need of them. Now the city is fast being made a network of telephone wires, for the people have begun to realize fully what a great laborsaving device the telephone really is, and soon nearly all the better class of residences and all the business concerns will have telephone connections,"

A deal has been put through whereby the Detroit Telephone Company of Detroit, Mich... and the New State Telephone Company, known as the Independent Long Distance State I xchinge Company, become the property of the Erie Telephone Company. The terms on which the negotiations were closed, it is said, call for the purchase by the Erie syndicate of \$500,000 of the stock of the Detroit company at fifty cents on the dollar, and the entire issue of bonds at eighty-five cents on the dollar. The bonds aggregate \$600,000. The purchase of the Independent State line stock was at the rate of fifty cents on the dollar for \$600,000 of stock and eighty-five cents on \$100,000.

Montclair, N. J., is to have a new long distance telephone line. Negotiations which have been in progress for some time have at last been consummated by which the majority interests in the local independent telephone company have d sposed of their stock to the Telephone, Telegraph & Cable Company of America. Dr. Morgan Wilcox Ayres, who was interested in the Montclair Independent Company, is reported as saying: "We hope soon to have direct connection with New York over the independent system's trunk line, and other advantages will accrue that will be profitable to our citizens. So far as I know, there will be, for the present at least, no change in the personnel of the local company, except that one or two direct representatives of the larger company will be placed on the local board."

#### A Barbed Wire Telephone System.

The following account of a barbed wire telephone system appears in the Chicago "Record":

"A telephone system has been opened at Anderson, Ind., that is one of the most unique and interesting things of the kind in the country. It is a long-distance line, and the wire is the upper strand of barbed wire fences reaching from Anderson to Ingalls, a distance of twelve miles. It is the idea of an eccentric inventor of Pendleton, Cassius Alley, and he has already begun to reap his little harvest. There are two long-distance lines of the big companies between the two points, but Alley, with his barbed wire affair, has entered the list and proposes to get business by giving cheaper rates.

"The Big Four has a barbed wire fence most of the distance along its right of way from here to Ingalls. Alley has taken the upper strand of wire for his unique telephone. Three miles from Anderson the line leaves the railway lines and cuts along farm fences. Where a road is crossed an overhead or underground wire is strung. Crossing streams there are overhead connections. The boxes are such as are used by the big telephone companies.

"There are two charter subscribers. A firm has an office here and a factory at Ingalls, and has them connected. The line works splendidly. Alley gets \$50 a year from each firm. Other places will be connected, and in a short time all six wires on the fences will be in service. It is then the intention to connect a line from Pendleton to Greensfield, and if Alley can do it he will soon have in service every wire fence in the country. He looks forward to a big business in the way of rural telephone service.

"When the line strikes cities or towns the fence wire gives way to ordinary wire that is strung along trolley line poles. Over roads and streams connections were made overhead or by underground conduits. The expense has been but a tritle.

"In some places the barbed wire has been insulated with a coating of rubber paint. Most places, however, small boys will have to keep off or get a shock every time the bell rings. Hunters, too, will have to look out. The service is practical and first class in every respect."

The multi-diaphone, which is one of the features of the telephone improvements that will be placed on the market by the American Telephone Repeater & Quad Company, is an ingenious appliance that is thought to be destined to revolutionize telephone communication, if successful, says the "Republican" of Springfield, Mass. It has been given careful tests by its inventor, Lewis Walkins, of Springfield, and the local members of the new company are quite enthusiastic over the matter. The invention is intended to follow the arrangement of the interior of a human ear, and by installing it on the line a message may be repeated on long-distance service. The inventions controlled by the new company will also, it is claimed, make it possible for any number of persons to use the same wire without interruption and a return circuit is not needed. By this improvement a common wire may be used for the telephone service and any of the telegraph wires through the country may be utilized at great economy in equipment. It is stated that Mr. Walkins has already received handsome offers for his patent.

The Citizens' Telephone Company of Houston, Texas, held the first annual meeting of its stockholders recently, electing the following directors: C. C. Greenleaf, H.Brashear, W. H. Eager, E. A. Glass and F. C. Bogart. These directors met subsequently and elected the following officers: President, C. C. Greenleaf; vice-president and treasurer, F. C. Bogart; secretary, E. A. Glass. The company expects to have its system in operation within the next three weeks. They have already about 1,200 subscribers and are putting in a new switchboard of 1,800 capacity. They now carry on their pay rolls about seventy men engaged in the work of construction.

At the annual meeting of the Diamond State Telephone Company held recently at Dover, Del., Harry A. Richardson, Richard R. Kenney, Dr. E. S. Anderson, Daniel J. Fooks, Stephen Slaughter, George W. Emroy and H. L. Evans were elected directors. The directors chose Harry A. Richardson, president; Dr. Anderson, vice-president, and du Pont Walker, secretary and treasurer. The company now has poles and equipments delivered as far as Newark, Del.

The New England Telephone & Telegraph Company is increasing its toll lines out of Springfield, Mass., about 20 per cent. This is to provide for the increase in business which is expected from the recent change in toll rates by the company. The business has not yet increased, but it almost always decreases at this time of the year, and it is expected that the spring will see a considerable increase. The company claims that the new toll schedule will be of great benefit to the average user of the telephone, who has held the instrument three minutes or less. This man has had in the past to pay

proportionately more than the user for a longer period, and so in a sense has paid for the service of the latter. With the new arrangement, the company says, every one will be paying for just what he receives.

Immediately after the arrival of Mr. Burton R. Dodge of Post Mills, Vermont, in Toronto, Ont., the preliminaries, in connection with the organization of the Dodge Telephone Company, which, during some months past, have been under way, were definitely completed; and steps will be at once taken to get down to active business. The prospects of the company are said to be of the most flattering character. Its operations it is thought will revolutionize the business of telephoning in Toronto, and eventually throughout Canada.

The Knickerbocker Telephone & Telegraph Company of 100 Broadway, New York, have some sixty canvassers at work obtaining contracts for the service of that company in this city. The contracts read that unlimited service in the bor oughs of Manhattan and the Bronx shall be furnished for \$60 a year, and unlimited service for the five boroughs for \$120. The contracts do not become operative until 5,000 subscribers have been connected with the exchange. It is understood a large number of business houses have signified their intention of becoming subscribers.

The annual meeting of the Northeastern Telephone Company was held in Rush City, Minn., recently, when the following officers were elected; A. J. Stowe, president, Rush City; P. M. Peterson, vice-president, Stanchfield; S. A. Nebel, a cretary, Danewood; J. C. Carlson, Rush City. The board of directors is composed of all the officers excepting treasurer, and including C. F. Jackson, Rush City. The compuny intends extending its lines to adjoining towns early in the spring and will make other improvements.

An accident recently occurred to the plant of the C tizens' Telephone Company in St. Joseph, Mo.. An electric light wire became crossed with a telephone wire and sent a current into the terminal board. Every fuse in that part of the terminal board was burned out and the telephone exchange was dumb all day. The current played havoc with the delicate and costly mechanism.

The United States Telephone Company, Columbus, O., has given a blanket mortgage to the Cleveland Trust Company in the sum of \$100,000. The mortgage is for twenty years, and expires in 1919. It bears 5 per cent. interest, and is payable in gold. The mortgage covers the property of the company in fifty counties.

A dispatch from New Kensington, Pa., states that after holding over the ordinance for almost two months the borough council has granted a right of way to the Federal Telephone Company. The company is also applying for similar privileges in Arnold and Parnassus, Pa.

At Antelope, Ore., the stockholders of the Wasco Southern Telephone Company have elected directors, of whom J. N. Burgess is president and F. N. Wallace secretary. The work of setting poles and stretching wires will commence about April 1.

The Westmoreland Telephone Company of Greensburg, Pa., is said to have sold its franchise to the Telephone, Telegraph & Cable Company of America, the consideration being \$25,000.

The South Carolina Telephone Company is said to be rushing the construction of its plant in Columbia, S. C. The system it is thought will shortly be in working order.

It is likely the private telephone line among the farmers in the vicinity of Moville, Ia., may be extended as a number have indicated a desire to enjoy its advantages.

The Bell Telephone Company proposes to make a number of important changes in its plant at Nebraska City, Neb.

#### TELEPHONE INCORPORATIONS.

The Manning Telephone Company, Manning, S. C. Capital stock, \$2,000. Incorporators: F. C. Thomas, D. M. Bradham, W. E. Jenkinson and R. L. Felder.

The Southwestern Telephone Company, Sante Fe, N. M.—
to build and operate a long-distance system from Santa Fe to
Lis Vegas and other points. Capital stock, \$25,000. Incorporators: A. A. Newberry, Oliver B. Steen and W. N. Townsend.

The Quannah Telephone Company of Quannah, Texas.—to construct, maintain and operate a telephone system. Capital stock, \$4,000. Incorporators: John Ledbetter, J. G. Witherspoon, A. J. Fires and M. M. Hawkins.



## SECURITIES. **ECTRICAL**

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gcn., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

## STOCKS.

PASSE	Ays.		PASSE	NG	ER R	AILW	ays.		PASSENGER RAILWAYS.								
-		Capital		Bate and Date of					Capital S	Stock.	Bate and Date of						
MANG.	Par	Authorz'd	Issued.	dast Div.	Bid.	Asked.	NAME.	Par	Authorz'd/	Issued.	Last Div.	Bid.	A=ke4				
Albeny. N Y Jan 22 United Traction.	100	2,000,000	<b>\$1,750,000</b>	1½ % Q., Nov. '98	130	132	Hartford Conn Jan 22: Hartford Street Ry. Co Hartford & West Hartford RR		\$4,000,000 1,000,000	\$200,000 247,000	8 % S., Oct., '98.	145	=				
(Consolidation of the Albany and Troy City Bailway.)					l		Holyoke Mass.—Jan 22.	1,~	400 000	400 000	9 8 A T. 100	200	2071				
Allentown PaJan 22		i			1	İ	Holyoke Street Ry. Co Hoboken, N. J.—Jan 22.	. 100	400,000	\$00,000	8 % A., Jane, '98.	200	2073				
Allentown & Lebigh Val. Trac Co		4,000,000	1,500.000	•••••		15	North Hudson Co. (N. J.) Ry. Co.	. 24	1,250,000	1,000,000	8 % , 18)2.	150	_				
Bridgeport, Conn—Jan 22 Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug., '98,	103		Indianapolis, Ind-Jan 22.		5,000,000	5,000,000	******	28	80				
Baltimore, Md Jan 22 a United Raliways & Eiec. Cocom.	50	24,000,000	13,000,000	***************************************	161/2	17	Lancaster, Pa.—Jan 22 Pennsylvania Traction Co		10,000,000	9,900,000 87,500			-				
Boston, Mass Jan 22		<b>.</b>	. 001 006	1 % () Ton 15 '08			West End Street Bailway			•1,000	•		=				
New England Street By	100 100 50	4,000,000 2,000,000 10,000,000 6,400,000	4,000,000 2,000,000 9,085,000 6,400,000	1 % Q., Jan.15, '97 5 % S., A. & O. 3% % S., Oct., '98. 4 % S., Jan. 2, '99. 24 % Aug. 98,	15 85 94 1 2 1 2	16 87 94 114 104	Louisville, Ky.—Jan 22: Louisville Rycom Louisville Ry	1 100	2,500,000	2,500,000	1½%, April '98, 2½%, S., Oct. 1, '98	69½ 110	111				
Brooklyn N. Y Jan 22: Brooklyn City By		2,000,000	1,928,400	•••••	134 725	236 725/8	Twin City Rapid Transitcom Twin Oity Rapid Transit? % pfd Montreal, Canada.—Jan 22:		17,000,000 8,000,000		13/4 %, Oct., '98.	186	137				
Brooklyn Rap. Transit Uo., tr certf eBrooklyn Heights Railroad *dBrooklyn Oity RRguar	100	200,000 12,000,000	200,000 12,000,000	8¼ % Q., Jan., '99	107	109 241	Montreal Street Ry. Co	. 50 100		4,000,000 6,000,000	8 % 8., M. & N. 13⁄4 % 8., J. & J.	8101/2 1.13/2	813 1063				
eBrooklyr., Queens Co. & Sub. RR. Coney Island & Brooklyn RR	100		1,884.200	2 % % Nov., '98	3 /5	::	Memphis TennJan 22:				,	25					
Rings County Elevated	100	4,500,000	4,500,000	1 % July 26, '97	76	77	Memphis Street Railway Co New Haven, ConnJan 22:	. 100	500,000	500,000	***************************************	26	-				
Nassau Electric Railroadpfd. 'Atlantic Avenue Railroad gBrooklyn, B. & W. E. Railroad	50	2,000,000 1,000,000	2,000,000	• • • • • • • • • • • • • • • • • • • •	::	::	Fair Haven & Westville RR New Haven Street Railway Co New Haven & Centerville	1 100	1,250,000	1,000,000	8 % S., Sept. '98. 2% % A., July '96.	46					
Buffalo N. Y Jan 27 : Buffalo & Niagara Falis Elec. Ry	100	1,250,000	1,250,000		74	75	Winchester Avenue RR	25		600,000	***********	47	=				
Buffalo Railway Co	100		5,870,500	1 % Q. Dec., '98.	101	103	New Orleans, LaJan 22:		040.000	040.000	4 % G T) - 100	1					
Columbus O.—Jan 22 (olumbus Street Railroad Columbus Street Railroad, pfd	100 100			l % Q., Feb., '99.	20	22	Canal & Claiborne RR. Co New Orleans & Carrollton RR New Orleans Traction Co new com New Orleans Traction Co new pfd	100	1,200,000	1,200,000	4 % S., July, '98.	1485 295 101					
Charleston, S. C.—Jan 22		1			l		aCrescent City RRguar bNew Or. City & Lake RRguar		2,000,000	2,000,000	8 % S., Jan., '99.	205					
Charleston City Ry. Co	50 35	1,000,000		8 % B.		-:	Orleans RailroadSt. Charles Street Railway	1 50	500,000	185,000	8 % S., Jan., '99. 4 % S., Jan., '99. 1½ %., June, '94. 1¼ %. Oct., '98.	561/4	52 87				
Chicago, Ill.—Jan 22.	~	1,000,000	200,000		"	••	New York-Jan 22:		' '		İ	"	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \				
Ohicago City Ry. Co Ohicago & South Side R. T. RR	100	12,000,000	12,000,000	8 % Q., Dec. 81, '98	275	280	Central Crosstown RK	100	600,000 650,000	600,000	2½ % Q. 2 % Q., Oct., '98. 1½ % Q., Nov., 98. 1¾ % Q., Jan '99. ½ % A., July, '98.	275 168	280 174				
Lake Street Elevated RR	100	10,000,000	10,000,000	•••••	12 7	3 25	Dry Dock, E. Brdw'y & Battery RR	100	1,200,000	1,200,000	1½ % Q., Nov., 98	125	150 16t 3				
Met. West Side El., pfd	107	15,000,000	2,500,000	2 % O To- 00	76 234	78 235	Bleecker St. & Fulton Fy. Ry. gua	100 100	900,000	900.000	% A., July, '98.	35 280	40				
North Chicago Street RR	100	500,000	249,900	8 % Q., Jan., 99	-01	230	gOen.Park, N.&E. Rivers RR. gua hEighth Avenue RR.		1,000,000	1,000,000	-/4 /1 To	195 475	24J				
South Chicago City Railway	100 1 <b>0</b> 0	2,000,000 20,000,000	1,608,200 18,189,000	1½ % Q., Feb. 99	11014	ıii	i42d St. & Grand St. Ferry RR.gua jNinth Avenue KRguar	ri 100	750,000	748,000	4½ % Q.	39 <b>5</b>	4'0 410				
Chicago West Div. Ryguar.	100	1,250,000 2,000,000	2,000,000	5 % 8.	::	85	kSixth Avenue RR	- 100	2,000,000	2,000,000		203	211				
Cincinnati, Ohio Jan 22:	Ì						Twenty-third St. R. R. Co. guar Second Avenue RR.	1 100	500,000 2,500,000	600,000 1,862,000	4½ % Q. 2% Q., Jan., '93. \$1 75 p. sh. Feb. 99.	89# 200	420 205				
Oincinnati Inc. Plane Rycom.	50	1,000,000	575,000	•••••	<b> </b>	••	m42d St., Manhatv'le & St. Nich. Av	100	2 500 000		\$1 75 p. sh. Feb. 99.	70	82				
Dincinnati Inc. Plane Rypfd. Dincinnati, Newport & Oov. St. Ry.	50 100	150 000	150 000	⅓ % Feb., '99. 2½ % Feb., 98.	83	89	*Union (Huckleberry) Ry	100	2,000,000	2,000,000	************	190	200				
Oincinnati Street Ry. Co	50 50	18,000,000	14,000,000 2,200,000	2½ % Feb., 98, 1½ % Q., Jan., '98 1½ % Q.,Jan., 98.	1201	121	Newark N JJan 22 : Consolidated Traction Co. of N. J	100	15.000.000	15.000.000	***************************************	64	65				
Cleveland, Ohio Jan 22	~	2,000,000	-,,	, , , , , , , , , , , , , , , , , , ,			North Jersey Street Railway Co United Electric Co. of New Jersey	100	6,000,000	6,000,000		29 ×	81 81				
kron, Bed. & Olev. Elec. By	100 100	1,000,000	1,000,000	14 % Jan., 198 3-5 % Jan. 199.	48 993	50 10J	Pittsburg, PaJan 22:		J.,000		76 76 = 1						
lieveland Electric By	100	12,000,000	12,000,000	14 % Q., Oct., '98	90	91	Allegheny Traction Co	50		500,000	2 %, Jan., '95.	54 25	15				
DetPoit, Mich.— Jan 22 Detroit Citizens' Street Ry	100	0.000.000	1,250,000		1002		Consolidated Traction Copfd.	50	15.000.000	15,000,000	3 %, Nov '98. 1½ % Nov. 7, '98.	61	62				
M. Wayne & Belle Isle Ry	100 100		1,200,000		100 3 175	:.	qOitizens' Traction Co	50	8,000,000	\$8,000,000	6 % A.	69	70				
Petroit Electric Railway	••••	250,000 1,000,000	1,000,000		90	100	sPittsburg Traction Co	50 50	2 500 000	1 000 000	81: % Nov 7 '98						
Dayton OJan 22:	100	250,000	200,000	**********	100	110	Pgh., Allegheny & Man. Trac. Co Pttsourg & Birmingham Trac. Ry.		1,400,000 8,000,000	1,400,000 12,994,889	2% %, July, 98, 2%, Aug., '95, 1%, Oct. '98	28	28 %				
Mty Railway Co	100 100	1,500,000 600,000		1½ % Q. 1% % Q.	1261/ <sub>5</sub> 160	:	Pittsburg & West End Ry. United Traction Cocom United Traction Copref.	50 50	8,000,000 1,500,000 17,000,000	1,500,000	5 % A., June 80, 98	10	16				

\*Unlisted † Ex div.

a The Unlisted Aliways & Electric Company comprises in its organization the Baltimore Consol dated Railways Company, the Baltimore Cuy Passenger Railway Company, all the lines of street railway operated by the secompanies, and also the Central Railway Co of Baltimore. The pref stock of U R & R & C Co Ina-been issued in the form of income bonds.

b Leased to B ston E evated Raimoad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to B rooklyn Rapid Transit Company.

stock owned by Brooklyn Rapid Transit Company; road operated by Brook yn Hit. Co.

f Shock owned by Kings County Traction Company; road operated by Brook yn Hit. Co.

f Shock owned by Kings County Traction Company; road located to Nassau Electric RR.

g Owned by Atlautic Ave RR and leased to Nassau system.

h \$30 per share on outstanding capital packar rental by lease — West Chicago St. RR. Co.;

\$250 100 of stock owned by North Chicago Street Railroad Company.

i Centrols by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Stree - Railroad Tunnel Company.

j 35 % per annum paid on outstanding capital as rental by lease—North Chicago Street Railroad Company; \$625,100 of stock owned by Chicago West Division Railway Company; 5% on \$1,000,-000 stock guaranted by West Chicago Street Railway Company; lease.

Cincinnati St. Railway purchased the Mt. A. & Klden Park road, assuming its bonds

• Unlisted. † Full paid. | Outstanding. ‡ Ex-div.
a Leased to New Orleans Traction Company at 6 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
c Leased to Central Orossown Rathroad at 8 % on stock and interest en bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
c Leased to 231 street Ry for 99 years; lease assigned to Metropolitan Street Rv.
f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Rillway.
g Leased to Metropolitan Street Rv. for 99 years from Jan. 1, 1893, at \$215,000 per annum.
i Leased to Metropolitan Street Rv. for 99 years from Jan. 1, 1893, at \$215,000 per annum.
i Leased to Metropolitan Street Railway for 18 % on each to k
j Leased to Metropolitan Street Railway for 18 % on capital stock.
m Controlled by Third avenue Railroad by rurchase.
l Leased to Metropolitan Street Rail way for 18 % on capital stock.
m Dividends of 15 % yearly guaranteed by Consolidated Traction Company.
o Controlled by Third avenue Railroad by rurchase.
n Dividends of 15 % yearly guaranteed by Consolidated Traction Company for 8 % ner annum on par value of stock.
r Leased to Consolidated Traction Company for 8 % on \$3,000,000 capital stock.
r Leased to Consolidated Traction Company for 4 % on capital stock.
s Leased to Consolidated Traction Company for 4 % on capital stock.

PASSE	AYS.		TELEPHONE AND TELEGRAPH COS.										
		Capital	Stock.						Capital	Stock.			
Kame.	Par	Authors d	Issued.	Bare and Date of Last Div.	E3d.	Asked.	Name.	Par	Authors'd	Issued.	Bate and Date of Last Div.	BM.	Label.
New Bedford Mass-Jan 22 Union Street Railway Co	100	\$850,000	\$850,000	2 %, Feb. 98.	160	165	Boston, Mass.— Jan 22. American Bell Telephone Co	100	50 000 000	28 650 000	142 X O Ton 199	927	l 831
Northampton, Mass-Jan 22			_				Erie Telegraph & Telephone Co New England Telephone Co	100	10,894,600	10,804,600	14% % Q., Jan., '99. 11 % Q., Feb 20, '99 \$1.50 p. sh. Feb '99.	03	10.34
Northampton Street Rv	100	800,000	225,000	4 % A., June '98,	170	178	New YorkJan 22. American Telegraph & Cable Co	100	14,000,000	14 000 000	112 8 0	96	99
Omaha Street Rv  Paterson, N. J.— Jan 22	100	5,000,000	5,000,000	8 % A. and N.	55	65	*Central & South Am. Teleg. Co *Commercial Cable Co	100 100	6,500,000 10,000,000	6,500,000	12 2 3. 14 2 3. 14 2 3. 14 2 3. 14 2 3. 14 2 4. 14 2 4.		17
Paterson Ry. Co	100	1,250,000	1,250,000	***************************************	54		Franklin Teleg. Co21/4 % guar. Erie Telegraph & Telephone Co Gold & Stock Telg. Coguar. 6 %.	100	1,000,000 5,000,000 5,000,000	4,800,000	1 % 8. 1 % Q., Feb., '99.	112 11834	118
Providence, R. L.—Jan 22 United Traction & Electric Co	100	8,000.000	8,000,000	% %, Oct '98.	108	108%	#International Ocean Tel Co.guar 6% Mexican Telephone Co	100	2,000,000			115	114
Philadelphia,—Jan 22 Fairmount Park Traus. Co [50 pd.	50	2,000,000	1,770,000	2 %, Dec. '97.	28	24	*New York & New Jersey Tel. Co *Pacific & Atlantic Telegguar. 4 % *Postal Telegraph Cable Co	25 100	5,000,000 2,000,000 15,000,000	15,000,000	2% % Q., Jan., '99. 2 % 8. 1 % Q.	78	1.5 82
Hestonville, Man. & Fairmount Hest'nvl'e, Man. & Fairm't % pfd. aFairmount Pk. & Had. Pass. Ry.	50 50 50	800,000	1 800.000	2% %, July 15, '98. 2 % S—July, '98. 3 % Feb. 1, '98.	47 75 76	48 76 16	*Sout'n & Atlantic Telg. Co.guar.5 % †Commercial Union Telegraph Co Western Union Telegraph Co	25	950,000 <b>50</b> 0,000	559,525 500,000		114 115	116 17%
Union Traction Co \$12½ pd «Electric Traction Co	50 50 50		29,930,450 8,297,920	% share Q.	845	4.1/4	†Div. guar. by Postal Teleg. Co. Miscellaneous Jan 22:		•	, 51,650,000	1,4,4,4,000.	20/4	
dOitisens' Passenger Ry Frankford & Southwark Pas. R (Lehigh Avenue Ry. Co	50 50	1,000,600	1,875,000	814 sha'e A—Apr.98	45 48	451	American Dist. Teleg. (Phila.) Bell Teleph. Co. (of Canada.)	26 100	400.000 8,960,000	8,561,000	1 % Q. 2 % 8.	21 189	84
dSecond & Third Streets By  aPeople's Traction Co	25 50 50	1,060,000	<del>    1</del> 771,076	A. & O. 89 share A. Mar. 98 8 %, A., April, '98.	90 3 0	90%	Chesapeake & Potomac Telep. Co Chicago Telephone Co	100 100	•••••	•••••	••••	68 200	65 210
Green & Coates Passenger Ry	50 50	1,500,000 500,000	1572,800 1150,000	85,25 share—1898. 8 % Jan., 1898.	151	145 152	Central Dist Prig & Telg.Co.(Pgh.). Empire & Bay States Telegraph Oo. Hudson River Telephone Co	100 100	750,000 2,000,000	750,000 2,000,000 2,500,000	• • • • •	75	150 76 115
hPeople's Passenger Rycom. hPeople's Passenger Rypfd. (Philadelphia Traction Co	25 	750,000	120,000,000	\$2 p. sh., Oct. 98.	96	 96⅓	*Northwestern Telegraph Coguar Providence (R. I.) Teleph. Co Southern New Eng. Teleph. Oo	50 50 100	2,500,000 8,000,000	2,500,000	⅓, <b>% Q</b> . 	90 136 .	::
Oatherine & Bainbridge St	50	1,000,000	400,000 580,000	6 % A—Mar., '98. 86 share—July, '98.	158	157	ELECTRIC LIGHT				ICAL MFG	. 00	<del>.</del>
†Empire Passenger Ry. Co Philadelphia City Pass. Ry Philadelphia & Gray's Fy. RR	50 50	1,000,000 1,000,000	1475,000 298,650	\$7.50 share July '98 \$8.50 share July '98	100	203	Boston, MassJan 22:					Ī	
Bidge Avenue Passenger Ry Philadelphia & Darby Ry.guar. 17th & 19th Ste. Pass. Ry. guar	50 50		200,000	\$12 share, July '98. \$2 share July, '98. 1½ % S., July, '98.	•••	309	Fort Wayne Electric trust receipts Ft. Wayne Elec Co. T. Sec. Series A. [General Electric Co. [old] com.	25 100		30.460.000	2 % Q., Ang., 1908,	33	12 : 4J
Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000 1,500,000	1885,000 1900,000	\$11 sh. A., July, '98 \$9.50 shre, July '98	348	240	General Electric Co. [new] " TH. Elec. CoT. Secur., Series D.	100	18,276,000		1% % Q., May '99.	117	118 124
West Philadelphia Pass. Bv Pochester, N. Y Jan 22:	50	750,000	1750,000	\$10 share, July '98	203	"	Westinghouse Elec. & Mfg.Co.com. Westinghouse El. & Mfg. Co. pfd. Westinghouse El. & Mfg. Co. assent.	50	4,000,000 11,000,000	8,996,068	1% % Q., Jan., '99.	40 62	40 ¼ t3
R chester Railway Co	100	5,000,000	5,000,000	******	15	16	New York.—Jan 22: Edison Elec. Ill'g Co., New York	1 1	9,188 000	7,988,000		119	120
Beading Traction Co		1,000,000 850,000	1,000,000 850,000	Semi-an.,Jan. & Jy Jan., '98.	24 186	26	*Edison Elec. Ill'g Co., Brooklyn Edison Ore Milling Co	100 100	4,000,000		1% % Oct., '98.	8	12
iEast Reading Electric By St. Louis Mo Jan 22	50		‡1,000,000	Jan., '98.	70	••	Electric Vehicle Oocom.     General Electric Oo. [old]com.   General Electric Oo. [new]"	100 100			2 % Q., Aug., 1848.	82 1 2	9a 123
Fourth Street & Arsenal Ry Jefferson Avenue Ry. Co	50 50	400,000	150,000 400,000	2 % Dec., 1888. 1½ % Jan., '99.	=		Interior Conduit & Insulation Co Kings Co. El. L. & P. Co	100 100	1,000.000	1,000,000 2,500,000		4.	135
Lindell Ry	100	2,500,000 2,500,000 2,500,000	2,479,000	1% % Jan. '99.	::	::	Pittsburg, Pa.—Jan 22 Allegheny County Light Co	100				166	172
Oitisens' RR	100	2,000,000 2,000,000	1,500,000 2,000,000	4 %, Oct., '98. 2½ %, Jan., '99. 1½ % Jan., '99. 50c., Dec., '89.	::	::	Philadelphia, Pa.—Jan 22.	50	000,000	800,000	Q	-	-
Missouri RR	50	1,000,000	2,300,000 300,000 500,000	1½ % Jan., '99. 50c., Dec., '89.	::	••	Edison Electric Light Oo *Electric Storage Battery Oocom.	100	8,500,000	• • • • • •		120	1501/8
Southern Electric Ry % pref.	100	1,000,000 2,500,000	2,500,000	8 %, Jan., '99.	76	18	*Electric Storage Battery Copfd. Northern Elec. Light & Power Co Southern Elec. Light & Power Co	100 10	550,000	550,000	•••••	116 20	120
Union Depot RB		' '		8 % A., July, '95.	••		MiscellaneousJan 22: Bridgeport (Conn.) Elec. Lt. Co	25					4.
Geary Street Park & Ocean RR	100		875,000	50c. monthly. \$2.50 share, '96. Q., 60c. per share.	116 50 62½	68	Missouri-Edison (St. Louis)com, Eddy Electric Mfg. Co	25	500,000	•••••	****	47 25 18%	43 26 15
Market Street Ry	100	1,000,000	550,000		•••	16	Hartford (Conn.) Elec. Light Co Hartford (Conn.) Lt. & Power Co New Haven (Conn.) Elec. Lt. Cc		175,000		<b></b>	128 6 195	183
Scranton, Pa — Jan 22 Scranton Railway Co m Scranton & Carbondale Trac. Co.	50 100	6,000,000 500,000	2,500,000 500,000		29 16 ½	80	Narragansett (Prov., R.I.) Elec. Co. Rhode Island Elec. Protec. Co	50	1,200,000		2 % Q., Oct., '98.	95 118-≨	100
m Scranton & Pitteton Traction Co.  Springfield III.—Jan 22:	100	1,050,000		***************************************	••	:-	Royal Elec. Co. (Montreal)				1% % Q 1% % Q 8 % 8, Dec. 1, 98.	198 18C	195 1°8%
Springfield Consolidated By	100	750,000	750,000	********			Woonsocket (R. I.) Electric Co †On Aug. 17 last by a majority vo	100 te of	the stock	holders ti	 he capital stock wa	105 16 red	106 uced
Springfield OJan 22 Springfield Street By	100	1,000,000	1,000,000	*********		11	to \$20,827,200, of which \$18,276,000 is Recently acquired the Edison II pany, the Municipal Electric Light	lumi	non and \$ nating Co.	2,551,200 p: . of Brook	referred. llyn and its consti	‡ Ex tuent	div.
Springfield, Mass.—Jan 22; Springfield Street Ry	100	1,200,000	1,166,700	6 <b>% A.</b>	207	212	ALLIE		INDU	STRIE	£8.		
Toronto Canada.—Jan 22 Toronto Ry. Co	100	6,000,000	6,000,000	15% % 8.	iC6	1053/4	Boston Mass.—Jan 22: Delaware Gas Light Cocom	50	#00.00v	500 00c	7 4 7	72%	
Montreal Street Railway Co Washington, D. C.—Jan 22:		4,000,000	4,000,000	4 % B.	312	312	Delaware Gas Light Copref.	50	10,000,000	500,006 200,00	J. & J.	96	••
Belt Ry. Co		112,000,000	J 12,000,000	65c, per sh, Oct. 97	92	9214		100	4,500,000	1,248,700 1,000,000	62 p. sh Jan. 26, '99 \$3 50 p sh. Nov '98.	:-	100
Joiumbia Ry. Co	50	707,000	652,000	6 % Å.	85 15	40 16	New YorkJan 22: Consolidated Electric Storage Co				••••	10	20
Wetropolitan RR. Co	50		458,900	2% % Q.		••	Safety Car Heating & Lighting Cocom Worthington Pump Cocom Worthington Pump Copfd	100	5.500.000	5,500,000 2,000,000	 7 % A		166 110
*Worcester Traction Cocom	100 100	2,000,000		8 % S., Feb., '98.	80 1245	31 6 105 %	Philadelphia Pa - Jan 22 :		_,,	2,000,000			
Worcester Traction Co6 % pfd Worcester & Suburban Street Ry Wilkesbarre, Pa.—Jan 22	1			4½ %, 189 <b>7</b> .	1	85	United Gas Improvement Coscrip. Welsbach Commercial Cocom	100	10,000,000		~~	1 11%	11/4 162 117/8
Wilkesbarre & Wyoming Val. Trac.					25	29	Welsbach Commercial Copfd. Welsbach Light Co Welsbach Light Co., Canada		500,000 525,100		2 % Q 	873 40 18/	57% 45
<ul> <li>Unlisted. † Paid in. ‡ Full a Leased to Hestonville, Mand b Consolidation Electric, Per</li> </ul>	k fai ople'	renount P sand Ph	assenger l illadelphi	ky, for 6 % on stock Traction compa	nies.	Fixed	Pittsburg, PaJan 22:				•		
oharges and all indebtedness of Traction Company. c Practically all shares owned	cons	tituent ai	id leased	companies assume	ed by	Unio	Standard Underground Cable Co	100		200,000 1,000,000		168	170
d Lease to Frankford & Souths e Leased to Electric Traction (	vark Jom i	Passenge	r Ry. assu	med by Electric T	ractio	on Co.	Miscellaneous Jan 22:  *Barney & Smith Oar Cocom.	100		1,000,000		29	<i>7</i> 5
f Controlled by Frankford & S g Leased to People's Passenge h Majority of stock owned by	r Rai	lway at \$5	pershare	. •			*Barney & Smith Oar Oopfd. Billings & Spencer Co Oonsol. Oar Heating Co	25 100		1,250,000	2 % 1% % Feb. '98	96 48	10J 52
i Lease d to Union Traction Co	mpa	ny.	·	•		1000 -	Johns-Pratt Co	100		*********		96 4 47	1 5 8 52
p.a, φ20,000 in 18 9-1900 and \$30 0 C declared as a dividend semi-annu	ner ally.	annum 1	bereafter,	payable semi-ann	n in ually	1866-7-8 , reutal	Sill well-Bierce Un				2 % Sept 1, 98.	17 96	14
k Dividend of 10 % guaranteed Dividend of 6 % guaranteed Leased and operated by the	∖by by R	Reading T leading Tr	action Co	mpany.	نده موا	on C-	St. Charles Car Co	ım	500,000	*******	••••	øi.	106
Moneyed and operated by the S	n i Bi	TOU DANGE	·ay (U., I	rmerry ocranion 1	. i acti	оц <b>СО</b> .	Umbicu.	•	•	l	•	ı	•

# BONDS.

PASSEN	GER R	AILWA	Y.		,		PASSENGER RAILWAY.								
	Amou			Interest				Amo	ant.		Interest				
NAME.	Authorized.	Issued.	Due	periode.	Bid.	Ashod	NAME.	Authorized.	Issued.	Due	periods.	Bid.	Asked		
Albany N. Y.  Date of Quotation—Jan 22, 1100  The Albany By	\$500,000 \$50,000 850,000 150,000	\$29,000 427,500 875,000 850,000 150,000	1940 1947 1919	M. & N. M. & N. M. & N.	*117 % *116 % *125 *123 *114	127	New Orleans La.  Dete of Quotation—Jan 22, 1100  Janal & Claiborne RR cons mtg. 8s. Crescent City RR	\$150,000 5,000,000 416,500 5,000,000 850,000 800,000 800,000	2,599,500 850,000	1899 1948 1908 1948 1907 1912	F. & A. J. & J.	1051/ <sub>4</sub> 1/8 112	112 113		
Baltimore Md.  Date of Quotation—Jan 22, 1000 United Electric Ry. Colst mtg. g. 4s	1,500,000 1,500,000 1,250,000 1,750,000 750,000 800,000 96,000 604,000 8,000,000 1,000,000	18,000,000 2,000,000 1,500,000 1,250,000 1,750,000 1,750,000 580,000 8,000,000 1,000,000	194° 1911 1929 1901 1942 1906 1912 1982 1922	J & D. M. & N. M. & N. M. & S. J. & D. J. & J. N. & M. J. & J. M. & N. J. & D.	102 7434 11876 119 104 121 101 1021/2 119 114 117	102½ 75 120 121½ 	New York.  Date of Quotation—Jan 22 1500  Atlantic Ave. (Brooklyn)Imp. g. 5s. Atlantic Av. (Brooklyn)tons. mtg. 5s. †Atlantic Av. (Brooklyn)Cons. mtg. 5s. †Bro'dway & 7th Avelst cons. mtg. g. 5s. Broadway & 7th Avelst mtg. 5s. Broadway & 7th Avelst mtg. 5s. Broadway & 7th Avelst mtg. 5s. Broadway Surfacelst mtg. 5s. Broadway Surfacelst mtg. 5s. Brooklyn City RR. Colst cons. mtg. 5s. Brooklyn City & Newtown. lst mtg. 5s. [Brooklyn City & Newtown. lst mtg. 5s. [Brooklyn Heights RRlst. mtg. 5s. Brooklyn, Q's Co. & Sub'nlst mtg. 5s. Brooklyn, Q's Co. & Sub'nlst cons. 5s. Brooklyn, Rapid Transitgold 5s. Bleecker St. & Fult'n Fer'y RR. Ist mtg. 7s. Bleecker St. & Fult'n Fer'y RR. Ist mtg. 7s.	1,500,000 759,000 8,000,000 12,500,000 1,500,000 1,125,000 1,000,000 2,000,000 2,000,000 250,000 8,500,000 4,500,000 7,000,000	1,966.000 7,650.000 1,500,000 500,000 1,125.000 1,000,000 6,000,000 2,000,000 448,000 250,000 8,500,000	1909 1981 1948 1904 1914 1924 1905 1941 1989 1988 1941 1941 1941	M. & 8, A. & O. J. & D. J. & D. J. & J. J. & J. J. & J. J. & J. M. & J.	95 107½ 115 123 104 08 115 105 116 115 101 104 112 107 109½	110 116 125 100 117 106 117 116		
companies, marked †, have been assumed by the United Railways & Electric Company.  Boston, Mass.  Date of Quotation—Jan 22, 1100  *Lynn & Boston RR1st mtg. g. bs. West End Street RyDeben. g. 5s. West End Street RyDeben. g. 4%s. #1,674.000 in escrow to retire outstanding bonds of absorbed companies.  Chapleston S. C.  Date of Quotation—Jan 22, 1100.  *Enterprise Street RR1st mtg. 5s. #10narleston City Ry1st mtg. 5s. #10narleston St. Ry .Co.	5,879,000 8,000,000 2,000,000	8,702,000 8,000,000 2,000,000	1902	J. & D. M. & N. M. & S. J. & J. J. & J.	114 1041/4 112	115 106	Central Crosstown RR 1st mtg. 6s. Contral Crosstown RR 1st mtg. 6s. Coney Island & Brooklyn RR 1st mtg. 5s. 2D. Dock, E. Bd'y & Bat'y R. gen.mtg. g. 5s. Dry Dock, E. Bd'y & Bat'y R. gen.mtg. g. 5s. Dry Dock, E. Bd'y & Bat'y RR scrip 5 %. Eighth Av. RR. Co Oert. indebt. 6 %. 42d St., Man. & St. Nich, Av 1st mtg. g. 5s. 42d St., Man. & St. Nich, Av 2d mtg. inc. 6s. 42d St., Man. & St. N. Av 2d mtg. inc. 6s. 42d St.	250,000	1,200,000 250,000 800,000	1902 1922 1908 1982 1914 1914 1915 1997 1909 1922 1919 1987 1909	J. & D. M. & N. J. & J. J. & J. J. & D. F. & A. M. & S. M. & S. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J.	101% 107 125 101 117 102 108 116% 82 124 120 120 120 118% 116 110%	108 109 108 120 105 117 125 121 109 117 1123 1283		
Chicago III.  Date of Quotation—Jan 22, 1900.  Ohicago City Ry	400,000 1,000,000 7,500,000 1,500,000 4,040,000 7,574,000 15,000,000 8,171,000 500,000 500,000 4,100,000 2,500,000 4,100,000 12,500,000	600,000 7,500,000 750,000 4,040,000 8,781,200 15,000,000 8,171,000 500,000 2,500,000 8,969,000	1908 1929 1929 1907 1982 1928 1942 1906 1911 1900 1927 1928 1911 1986	F. & A. J. & D. A. & O. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. M. & N. J. & D.	1013/4  108/ <sub>6</sub> 106  108  101 106%	1021/4 102 109  96%  111 102 107	tit Westchester Electric RR lat mig. 5s. 151,085,000 in escrow to retire gen. mig. bonds. 134,850,000 in escrow to retire maturing obligations. 1355,200 in escrow to retire lat and 2d mig. bonds. 2in treasury, \$80,000. 11 Guar. by Union By. Co.  TOPONTO CANACA.  Date of Quotation—Jan 22 1100  Montreal St. Ry	2,500,000 500,000 2,500,000 4,550,000	2,000,000 500,000 800,000 2,200,000	1942	F. & A J. & J. M. & S. M. & S.	118	116		
†Redeemable at option on 60 da. notice. IF unded debt assumed by Ohicago W. Div. Ry. Oo., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.  §Subject to call after Oct. 1, 1899, at 110 and interest.  Assumed by W. Ohi. RR. Oo., lessee. Int. guar. by W. Ohicago St. RR. Co.  Cincinnati, O.  Date of Quotation—Jan 22 1600.  Date of Quotation—Jan 22 1600.  Mt. Adams & Eden P'k In1st mtg. 6s. Mt. Adams & Eden P'k In1st mtg. 6s. Mt. Adams & Eden P'k In1st mtg. 6s. Mt. Adams & Eden P'k Inc. Cons. mtg. 5s. So. Cov. & Cin. St. Ry2d mtg. 6s. † Assumed by the Ohich. St. Ry. Co., 18250,000 reserved to retire let mtg. bds.	8,000,000 46,000 100,000 581,000 250,000 400,000	100,000 581,000 250,000	1900 1905 1906 1912	J. & J. A. & O. M. & S. M. & S. J. & J.	118 % 108 % 1 4 108 % 12: % 182 %	1141/4 104  1221/4 187	Date of Quotation Jan 22 1100 Continental Pass. By	850,000 800,000 100,000 150,000 250,000 500,000 1,125,000 5,698,210 200,000 1,300,000 500,000 29,785,000 29,785,000 750,000	810,000 200,000 100,000 250,000 458,000 867,000 200,000 1,018,000 500,000 29,724,876 246,000 750,000	1900 (898 1901 1905 (911) 1912 (948)	J. & J. J. & J. J. & J. J. & J. J. & J. J. & S. J. & O. A. & O. A. & O. M. & N				
Cleveland, O.  Date of Quotation—Jan 22 11:00  Brooklyn Street RR. Coist mtg. 6s. in. New't & Oov. St. RyCons. mtg. 5s. lleveland City Cable Ry!st mtg. 6s. St. RyCo. Ist mtg. 6s. St. RyCo. Ist mtg. 6s. St. RyCo. Ist mtg. 6s. St. Ryst mtg. 5s. t. Wayne (Ind.) Elec. Ry. Ist mtg. 6s. St. Ry. Co., Grand RapidsIst mtg. 6s. St. Ry. Co., Grand RapidsIst mtg. 5s. ft. 900000 in escrew to retire boads of bsorbed companies, marked a. Interest guar. by Cons. St. Ry. Co.  DetPoit, Mich.	600,000 8,000,000 2,000,000 1,500,000 1,000,000 600,000 600,000	2,500,000 2,000,000 1,249,000 1,500,000	1922 1909 1918 1918 1910 1922 1915	J. & J. M. & S. M. & N. M. & S. M. & N. J. & J.	106% 118% 105% 106	107 114. 106 107 	Pittsburg. Pa.  Date of Quotation—Jan 22 1900  Birmingham, Knox & Allentown	500,000 875,000 1,250,000 1,500,000 50,000 1,250,000 750,000 750,000 1,500,000 500,000 1,500,000 2,500,000 500,000	500,060 875,000 1 250,000 1,500,000 50,000 1,250,000 750,000 750,000 1,500,000 1,400,000 2,000,000	1927 1980 1918 1942 1928 1924 1927 1929 1922 1980 1984	M. & S. J. & J. A. & O. J. & J. J. & J. J. & J. A. & O. J. & N. J. & N. J. & D. V & S	110	118		
Date of Quotation—Jan 22 1100 Detroit Citizens' St. RyIst mtg. 5s. L. Wayne & Belle Isle RyIst mtg. 5s. Detroit Ry	7,000,000 400,000 1,800,000	8,885,000 877,000 1,800,000	1902	A. & O.	105	102½ 106½	Providence R. I.  Date of Quotation—Jan 22 1100  Newport Street By	50,000	50,000 8,260,000		J. & D. M. & 8.	114	118		
Date of Quotation—Jan 22 1:00 w Haven St. Ry	600,000 250,000 100,000 100,000	600,000 250,000 500,000 24,000	1914 1912	J&D M&N	111 111 109	1	Cast Ave. & Fair Gds Rylst mtg. 5s. Citizens' Railway Colst mtg. 5s.	1 000 000 1 600 000 2,000 00 1 00 000	250,0°0 1,60°,00 1,500,000 000 000	1912 1907	J&J J&J J&J	100 2 109 117	102 1(21/4 1051/4 118		

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PASSENGER RAILWAY.										
NAME.	Anthorized	Issued.	Due	Interest periods.	Bid.	Asked.				
St. Louis.  Date of Quotation—Jan 22, 1:03										
Jefferson Avenue By	1,000,000 400,000 125,000	1,500.000 700,000 800,000 125,000 75,000 800,000 75,000 2,000,000 1,400,000 800,000 500,000	1911 1916 1902 1902 1904 1906 1900 1921  1909 1918 1900	J. & J. J. & J. M. & N. F. & A.  M. & N. J. & J. A. & O.	103 168 105 100 100 99% 103 80 106 116 100 121	105 106 106 102  101 100 × 104 84 108 118 100 × 122				
San Francisco Cal.										
Date of Quotation— Jan, 1980. California St. Oable BR	1,000,000 650,000 1,000,000 8,000,000 200,000 2,000,000 850,000 250,000 700,000 1,000,000	650,000 671,000 8,000,000 2,000,000 350,000 250,000 700,000	1914 1921 1918  1918 1912 1914 1912	J. & J. A. & O. J. & J. J. & J.	114  126 ½  126 ½ 105 ½ 115	117 117 95  107				
Date of Quotation—Jan 22, 1500  Belt Ry. Co	500,000 500,600 200,000 500,000	450,000 500,000 200,000 500,000	1914	A. & O. J. & D.	1+2	•••••				
Bridgeport Traction Coist mig. 5s. Ruffalo (N. Y.) Ry. Co Cons. mig. 5s. to 'tizens' St. B. (Ind'polis). let cons. m. 5s. to Cosetown St. Ry. (Buffalo)let mig. 5s. to Cosetown St. Ry. (Buffalo)let mig. 5s. to Consolidated Traction (N. J.)lst mig. 5s. Consolidated Traction (N. J.)lst mig. 5s. Consolidated Traction (N. J.)lst mig. 5s. Denver Other College Rylst mig. g. 5s. Denver Con. Tram'y CoCon. m. g. 5s. Amineapolis St. Rylst cons. mig. g. 5s. Minneapolis St. Rylst cons. mig. g. 5s. Mo. Hudson Co. Ry. (N. J.) Deb. 6s. No. Hudson Co. Ry. (N. J.) Deb. 6s. No. Hudson (N. J.) By Cons. mig. g. 6s. Mochester (N. Y.) Ry	2,000,000 5,000,000 4,000,000 8,000,000 15,000,000 15,000,000 4,000,000 6,000,000 5,000,000 5,000,000 1,250,000 5,500,000 1,250,000 5,500,000 1,250,000	1.688.000 8.543,000 8.000,000 2.366,000 2.366,000 8.800,000 922,000 4.981,000 1.050,000 2.378,000 4.981,000 4.981,000 4.981,000 4.981,000 4.981,000 1.000,000 1.000,000 1.000,000 1.000,000	1981 1988 1982 1982 1983 1983 1983 1920 1938 1930 1919 1928 1928 1928 1928 1930 1931 1938 1930 1938 1938 1938 1938 1938 1938 1938 1938	J. & J. J. & D. J. & D. J. & J. A. & O. J. & J. J. & D. J. & J. J. & D	108 118 104 112 115 11-14 115 20 19 11014 108 105 108	110 105 118 1118/2 115/2 85 119/2 110/2 110/2				
ELECTRIC LIGHT AND	ELE	CTRIC	AL			OS,				
Poston, Mass.  Date of Quotation—Jan 22 1600  Delaware Gas Lt. Co	800,000 2,020,000 10,000,000		922	J. & J. Quar.	106 167 1.6	••••				
Allegheny County Light Co6s. Westinghouse Elec. & Mfg. CoScrip 6s. Miscellaneous.—(Jan 22, 1900.)	500,000 195,570			J. & J. M. & S.		•••••				
Edison El. Ilig. Co. (N. York) 1st m. 5s	4,812,000 15,000,000 5,000,000 2,000,000 2,500,000 5,176,000 8,000,000 5,000,000	2,188,000   1 5,090,000   1 2,500,000   1 5,176,000   1 6,103,000	997	A. & O. A. & O. F. & A.	109 124 122½  100 120 102½	101				
Miscellane US.  Date of Quotation — Jan 22. 1100  American Bell Telephone	•••••	jı	911	F. & A.  J. & D.	100½  114 108	101				
Miscellaneous.	INDUS	TRIES	1	1	ı					
Date of Quotation—Jan 22, 1100  American Electric Heating	500,000  75,000	i	942 904	J. & J J. & D.	106	25 11 g				

## NOTES FOR INVESTORS.

Late quotations for copper are : Electrolytic, 153@16c.; Lake, 16@16½c.; casting, 15½@15‡c.

The United Traction Company, of Albany, N. Y., has authorized the issue of \$1,000,000 new stock to pay for re equipping the Troy division.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 15(220; New York Electric Vehicle Transportation, 94(494; New England Transportation, 64(474).

The Bell Telephone Company of Philadelphia, Pa., has declared a dividend of 2 per cent., payable January 27. The stockholders of this company will meet March 20 and vote on the proposition to increase the capital from \$4,000,000 to \$6,000,000.

The stockholders of the Nassau Electric Railroad, of Brooklyn will hold a special meeting February 13, to approve a lease for 999 years to the Brooklyn Heights Railroad, of all property, rights, privileges and franchises except its franchise and the right to be a corporation.

It is understood that Vermilye & Company have purchased the entire amount \$440,000, of Worcester Consolidated Street Railway Company 20-year 4½ per cent. bonds, issued to refund all the present outstanding bonds. The new issue has been approved by the Massachusetts Railroad Commissioners.

The real estate and plant, wires, poles and lights of the Charlestown Electric Light & Power Company, a corporation of Charlestown, W. Va., were sold at public sale by B. D. Gibson, trustee, to C. E. Ehrehart, of Hanover, Pa., for \$10,150. The sale was made to pay mortgages and to settle the estate of H. S. Rieley, deceased, of Hanover, who was a stockholder in the company.

The Council of the city of Washington, Ind., has purchased the local electric light plant, paying for the machinery and buildings \$67,000; for a three year's franchise, \$10,000; for interest and cost of incorporation into a company, \$32,050, making the total cost of the plant \$109,050. It will be owned and conducted by the city under the name of the Washington Light & Water Company.

The Capital Traction Company of Washington, D. C., has decided to issue bonds to the amount of \$1,500,000. This sum goes to replace the expenditure of the company made necessary by the installation of the underground system and the purchase of new cars. The stockholders will be offered \$1,080,000 of the issue at par, while the remaining \$423,000 will be set aside as treasury stock.

Jodge Gray, in the United States Circuit Court, has refused to grant a preliminary injunction to have set aside the lesse of the Consolidated Traction Company's lines in E-sex and Hudson counties, N. J., to the North Jersey Street Railway Company. The injunction was desired to restrain the payments of rentals under the lesse in the snape of dividends to the stockholders of the Consolidated Company.

At a recent conference with officials of the Manhattan Elevated Railroad Company of New York the Park Board decided to give the company time to file new plaus before taking decisive action against the further use of Bittery Park for the "L" loop. It is further asserted that officials of this company have infermed the State Railroad Commissioners that the road will comply with the recommendations of the board and extend its east side line from 177th street to the Bronx Park at Bedford Station.

The stockholders of the Birmingham Railway and Electric Company of Birmingham, Ala., will hold a meeting on February 14 for the purpose of considering the question of increasing the bonded indebtedness of the company by borrowing a sum of money not exceeding \$3,000,000 such indebtedness to be secured by a mortague or deed of trust upon the railroads, franchises, rights, privileges, property and assets of said company and to be evidenced by bonds to bear not exceeding 6 per cent, interest per annum.

At the annual meeting of the Kings County Electric Light and Power Company stockholders the following directors were elected: Felix Campbell, Hugh J. Grant, T. S. Williams, William Berri, Seth L. Keeny, Charles Cooper, A. M. Young, Walton Ferguson, Sr., B. Gallagher, A. N. Brady, H. C. Duval, Thomas E. Murray and William Speehan. After the directors were elected they met and organized with Anthony N. Brady, president; A. M. Young, vice-president; W. W. Freenan, secretary; A. W. Dater, treasurer, and A. N. Neilson, assistant treasurer.

secretary; A. W. Dater, treasurer, and A. N. Nellson, assistant treasurer.

A Hartford paper states that on recommendation of the directors of the Hartford Electric Light Company, the capital stock will be increased from \$700,000 to \$1,000,000. The new stock will be allotted at par to old stockholders and will be used to pay for the new power developed at the Farmington river, and a new storage battery at the Pearistreet plant which will be used for other purposes. There are \$150,000 of 6 per cent. first mortgage bonds of the Hartford Light & Power Company, which it has guaranteed, that are subject to call at any time and which may be retired.

The Hudson River Water Power Company, recently organized, in addition to securing four and one-half miles of land on both sides of the Hudson River, some five miles below Glen Falls, has secured an option on the plant of the Saratoga Gas, Electric Light & Power Company, a concern with present net earnings of \$49,000 a year. It is proposed to issue \$750,000 5 per cent. 3) year gold bonds to pay for the two properties and to provide for the construction of a 72-foot dam and power and transmission plant. These bonds will be offered at 101 and interest. The total issue is limited to \$1,500,000.

It is understood that the rapid transit tunnel commission and Comptroller Coler will ask the New York Legislature to amend the charter of Greater New York so as to recognize explicitly the rapid transit commission and to authorize the comptroller to is ue bends as work on tunnel progresses without consulting the municipal assembly. It is estimated that the tunnel will add \$600,000 to realty values along its line by the time express trains are run "to Harlem in 15 minutes." Much of this gain has already been discounted in the Upper Broadway. Harlem and Bronx districts, where values have already risen 40 per cent. to 200 per cent.

For the development of the lines now under its control and for its future growth, a mortgage for \$5,000,000, made by the Rhode Island Suburban E ectric Railway Company in favor of the Union Trust Company of Providence. R. I, has been recorded. The mortgage is made to secure the issue of \$5,000,000 of bonds. The property covered by the mortgage includes the Warwick and Oakland Beach road, now operated as a branch of the Stonington division of the New York, New Haven & Hartford Railroad, and to be opened as an electric road by the Suburban Company. The Rhode Island Suburban Railway Company is capitalized for \$5,000,000, with authority to issue \$5,000,000 in bonds in addition to that amcunt in stock.

000, with authority to issue \$5,000,000 in bonds in addition to that amount in stock. The present capital stock of the Third Avenue Railroad Company amounts to \$40,000,000 authorized and \$16,000,000 paid in. An increase from \$12,000,000 was voted by the stockholders last July. The bonded debt is \$5,000,000. The increase in capitalization was to provide for improvements, change in motive power and payment of floating debt. The floating debt to be retired amounted on June 31, 1899, to \$13,385,123. The underwriting of the floating debt will be undertaken by a syndicate headed by both Kuhn, Leeb & Company and J. P. Morgan & Company. In 1896-97 dividends of 82 per cent. were paid. in 1897-98, 8 per cent., in 1898-99, 72 per cent. In November last the quarterly dividend was reduced from 12 per cent. to 14 per cent., placing the stock on a 5 per cent. basis.

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# FLECTRICITY

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#### EDITORIAL NOTES.

Facts About the Independent Telephone Situation in Michigan.

About two weeks ago the Erie Telephone Company obtained control of the Detroit Telephone Company of Detroit, Mich., and of the New State Telephone Com-

pany, known as the Independent Long Distance State Exchange Company. These two companies operate about 6,000 miles of long distance lines and have about 10,000 subscribers in Detroit and other Michigan cities and towns. This move on the part of the Erie Telephone Company was hailed with delight by the anti-independents, and it was given out that as these two companies controlled some 70 per cent. of the independent exchange business in Michigan the deal was a heavy blow to the independent telephone movement not only in the West but throughout the whole country. Referring to this subject Charles J. Glidden, president of the Erie Telephone Company, is reported as saying:

"The independent telephone promoters of the country have acknowledged these two companies as the foundation of the independent telephone movement in the United States. The close of these negotiations we believe to be the beginning of the end of the independent telephone movement. There may be further consolidations,"

Now as a matter of fact the two companies taken over by the Erie Telephone Company by no means represented 70 per cent. of the independent business in Michigan. as will be seen by the following communication from Mr. J. B. Ware, secretary of the Citizens' Telephone Company of Grand Rapids, Mich.;

GRAND RAPIDS, Mich., Jan. 22, 1900. Editor Electricity,

Sir: We thank you for the clippings sent us. The writer has been too busy the last few days to give any details of the situation. Briefly, however, can say the Eric Company has secured a majority of the stock in the Detroit Telephone Company and the New State Telephone Company; said companies each have the same board of directors and were organized by the same men.

The former company was built upon the proceeds of bond sales of \$600,000, the stock being given away, either with the bonds or issued by the directors, so that for the sale of the stock

to the Erie Company a good profit was realized by the holders of said stock.

The New State Company had no bonds, but a very large quantity of stock had been issued and all the exchanges and toll lines of said company had been built under contracts with the Construction Company, which was owned by the same board of directors above mentioned, so that there is no charge that any loss has ever accrued directly or indirectly to said directors.

The property owned by said companies approximates nearly thirty per cent. of the independent telephone property in Michigan.

Mr. Flowers, the president of the New Company, announces officially that the companies will be continued as independent and thus far there is no change in their relation to the other companies of the State, as business is being received from the independent toll lines connecting with said companies the same as heretofore.

Our company naturally covers the territory which is tributary to Grand Rapids, and less than 5 per cent, of our business passes to points on the New State Company's lines and less than 2 per cent. goes to Detroit, so that while the defection of the Detroit Company is unfortunate, it is not a surprise nor is it a calamity.

The enclosed clipping shows the attitude of the Erie Company toward the West Michigan Companies, but owing to the fact that President Glidden announces that the rates for business telephones will be \$48, while we charge but \$30 for the same service (being metallic circuit with long distance transmitter 'phones), it is readily seen why our company and especially our community cannot sell its interest to the Erie Company.

There is no disposition on the part of any element and much less the companies in Western Michigan to turn over to the Erie Company any more of the independent property of the State. Yours truly.

CITIZENS' TELEPHONE Co.,

Per J. B. WARE Secretary.

The clipping referred to in Mr. Ware's communication is taken from a Grand Rapids paper and quotes President Glidden as follows:

"I am not here to negotiate with the Citizens' Telephone officials and have made them no offer whatever. Neither have they approached me. I would willingly enter into negotiations with them, however, for I think the amalgamation of the two companies is sure to come about

sooner or later; that the telephone business is naturally a monopoly.

"We do not intend to freeze out any stockholders. All will be protected if the consolidation is effected. Our rates would not be raised from the present figures and we would be willing to make twenty-five-year contracts, give subscribers the privilege of changing from one rate to another, or of canceling their contracts at pleasure.

"A sliding scale of rates would be put into effect under the consolidation, if it should be made. Contracts would be made at the present prices. The best long-distance, metallic-circuit 'phones for business places cost \$48 a year and the lowest business place rate is \$18 a year. For residences the rates vary between \$36 and \$12 a year."

From what appears above it may readily be inferred that the defection of the two independent companies in question is not such a great victory for the Bell monopoly as the daily papers and officials of the Erie Telephone Company would lead one to suppose, and as for its being the beginning of the end of the independent movement in the United States it can safely be asserted that it does not even sound the death knell of the independent movement in Michigan alone regardless of the rest of the country.

\* \* \*

Projectiles to be Fired by Electricity. In the issue of ELECTRIC-ITY of April 20, 1898, there appeared a short article descriptive of an electrical dynamite gun, invented by

a resident of Washington, D. C. By means of this weapon shells containing high explosives could, it was thought, be thrown a distance of five or six miles by making use of a solenoid as the projecting power. Whether this type of gun was given a trial and proved a failure or whether the invention was allowed to sink into oblivion, like so many other devices for which patents are obtained, we are unable to say, but one thing is certain, and that is that nothing more was heard of the so-called electric gun until recently when a New Orleans, La., paper appeared with the statement that a resident of that city had brought out an electric gun operated on practically the same principle as the gun described by us some two years ago. According to the paper already referred to the cannon never gets hot, and can be fired as fast as it can be fed, indeed two or three shots can be going through it at the same time. The modus operandi is described as follows:

"If a tube is wound with insulated wire and an electric current is sent through the wire, magnetic attraction is set up inside the tube, and small pieces of firon or steel may be drawn toward the center. This is a familiar experiment in physics. If an iron rod fitting the tube is placed near it it will be drawn into the tube by the force of the magnetism. The current is cut off the instant the iron rod or projectile reaches the center of the tube. Then it meets with no resistance beyond the center, but darts on through the tube. If after passing through one tube it enters a second tube in which the same process is repeated, it gains additional momentum, and if it passes through still another tube, all in a straight line, its momentum can be increased until it acquires enormous speed."

The great trouble with a gun built on this principle would seem to lie in the fact that in order to obtain a high muzzle velocity an exceedingly long tube would be required which

must be kept in perfect alignment, which requirements would necessarily limit the field of usefulness of the weapon.

Theoretically such a gun should accomplish what is expected of it, but unfortunately unforseen difficulties have a habit of cropping up when inventions are tried on a practical scale, and the electric gun would probably be no exexception to the rule, for as nearly as can be ascertained no model larger around than an ordinary lead pencil has as yet been constructed by the New Orleans inventor.

The merits claimed for such a gun are its freedom from smoke and noise, its lightness, its cheapness, the fact that the barrel does not become heated, and that it is possible to fire the weapon as fast as it can be loaded. On the other hand, the inventor is said to frankly admit that his cannon will scarcely do for field service, as it would be necessary for the artillery to carry along powerful electric batteries, but that it is just the thing for fortifications where connections can be made with dynamos. He is also of the opinion that, it would be well adapted to the discharging of dynamite and gun cotton. In fact owing to the absence of rifling this would seem about the only use to which such a gun could be put, providing of course the principle was found to work all right on a large scale. As the New Orleans inventor proposes to construct at once a large service model with a view to testing the practicability of his ideas, an opportunity will be afforded the public of ascertaining whether electricity can be successfully applied to the throwing of heavy projectiles or not.

## UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

It is announced in Washington that exhaustive investigations will soon be conducted by the Weather Bureau with the Fessenden system of wireless telegraphy.

THE Niagara Falls Power Company has passed a resolution stating "that the company is opposed to a duty upon electricity generated in Canada and transmitted to the United States: that the imposition of such a duty is not required for the protection of any American industry, and that it might invite retaliatory legislation by the Canadian Government."

WE are informed by Secretary George F. Porter that the dates decided upon for the twenty-third Convention of the National Electric Light Association are May 22, 23 and 24, 1900. The meeting will be held in Chicago.

THE "Industrial Exchange" of New York has gone out of business, the sheriff having taken possession of the effects to satisfy a judgment of \$14 in favor of the General Electric Company.

A dispatch from Berlin, Germany, says that the Berlin Elevated Railroad Company intends to introduce electric motive power, at a cost of \$10,750,000. The projected system will be modeled after the Chicago South Side Railroad, the present steam system having proved inadequate.

EXPORTERS will be interested in an opinion just rendered by Attorney General Griggs to the effect that upon bills of lading, receipts, manifests, and other similar documents issued

by railroad companies for the receipt of goods to be transported by rail from any place in the United States to Canada or Mexico, a stamp tax of 1 cent is payable under Schedule A, of the war revenue act of June 13, 1898, and that no tax is payable thereon under the clause relating to goods exported from a port or place in the United States to any foreign port or place. In other words, export bills of lading issued for goods shipped by rail outside of this country require a 1-cent stamp and not a locent strup, as heretofore required by the Internal Revenue Bureau.

Signor Guarini of Brussels has patented an apparatus which is said to be an improvement upon. Signor Marconi's method of wireless telegraphy. It will be tested between Brussels and London. He talks of wireless communication between London and New York as "well within the range of probability."

A new and attractive feature has been added to the many attractions at St. Augustine, Fla., for the amusement and entertainment of the visitors, in the way of electric launches for pleasure-seekers. Four new electric launches were recently sent there from New York and are now ready for the season's service.

UNITED STATES CONSUL NELSON at Bergen, Norway, says that the projected telegraphic communication with Iceland is interesting all of Northern Europe. The main question of issue is in laying the cable, which will be 403.89 miles long, extending between Iceland and the Shetland Islands. The Northern Telegraph Company of Copenhagen, Denmark, has offered to lay the cable under a peculiar contract, which calls upon Iceland to pay a yearly subsidy of \$9,380 for twenty years; Denmark, a yearly subsidy of \$13,400, and the neighboring countries an aggregate sum of \$91,450. This, with the interest, would give the company \$1,407,000—a good profit, considering that the cost of laying the proposed line would not be over \$850,000.

Representatives of the Model Marine Motor Company announce that they will be in New Haven. Conn., in the course of a few days "to demonstrate the value of the model marine motor to all those who use electric light, heat and power, and the company believes that its efforts to present a plan whereby New Haven can secure cheaper light, heat and power, nevertheless at a profit to itself, will not have been in vain. New Haven has been selected as the basis of operation by the company because it is contiguous to to the wave motion of Long Island Sound, which is necessary to the successful application of the principles on which this new apparatus is devised, and is peculiarly adapted to the successful operation of a large storage battery. It is also the seat of a large population and many industries, which are large consumers of light, heat and power.'

A Mysterious illuminated sentence-writing stylus for use as an advertising novelty, employing electric flashes to heighten its effect, has been ingeniously worked out by a resident of Toledo, O. As a matter of fact electricity has nothing whatever to do with the production of the writing, this being produced by covering a glass writing surface with an opaque paint and removing this paint with a leather stylus, thus permitting the light from some source, such as an incandescent lamp, to show through, forming illumined letters. It is the mysterious



the appearance of each letter that, attracts attention and gives novelty to the scheme. This flashing effect is produced by the stylus, which is designed to be held in the hand in the usual manner for writing. The spring carries at its end a carbon point, and opposite to it on the body of the holder is another carbon point, each of which is connected to one side of an electrical circuit. When this circuit is made and broken between the carbon contacts by depressing and releasing the spring, an arc is formed between them, and as this arcing is continued during the writing and appears just above the last part of the letter formed it gives a weird, startling effect. Provision is made in the stylus to embody in it aspestos to protect the fingers from being burned by the heat generated by the continuous arcing.

CHARLES JARROTT, the amateur motor-cycle champion of Europe, who arrived in New York last week from England, is anxious to race in this country for \$5,000 a side, the money to buy a trophy, for Mr. Jarrott does not ride for cash. He said that he was willing to ride any distance on road or track. Henri Fournier, the noted French automobilist, now in this country, promptly announced his intention of accepting Jarrott's challenge. Fournier's employers will back him. If the match be arranged, and it probably will be, the Frenchman will ride an American cycle driven by an American motor. Both men are to ride in the next Paris-Bordeaux race.

An electric balloon for night signaling is among the latest ideas, especially for use in the Boer war. According to the plan, the balloon, made of gold-beaters' skins, carries a number of electric lamps, which are connected by wir with an apparatus below. These lamps are flashed at intervals corresponding to the dots and dashes of the Morse code, and on a clear night can be seen 100 miles away. The balloon may be sent up some distance from an army, connection with the ground apparatus being made by wire. The chance of the balloon being hit by sharpshooters is small, as it is sent up at night, and unlighted, so that when the signals are begun it is out of range. A number have been sent out to South Africa to be tested.

THE story of Thos. A. Edison's constant smoking while at work in his laboratory seems to be only partially true. He puts a cigar in his mouth when he begins work, but at once becomes so absorbed in his work that he often forgets to light it, though he keeps "drawing on .t " vigorously all the time,

THE General Electric Company reports that it has received a contract from the Sao Paulo, Tramway, Light & Power Company of Sao Paulo, Brazil, for one of the largest and highest tension power transmission plants ever exported. The value of the equipment is said to be \$200,000,

In a recent issue there appeared a short item referring to the influence of Roentgen rays on selenium, as determined by M. Perreau, a French scientist, and for which we were indebted to the "Electrical Engineer," London. The same contemporary now gives further details. M. Perreau experimented with a thin strip of selenium which had under normal conditions a resistance of 40,000 ohms. It was contained in a via: box which could be closed by an aluminum lid. The resistance of the strip when exposed to the diffused light from a gas-burner placed

and magical effect, however, that accompanies about 5 ft. away rapidly fell to 33,000 ohms. When the light was withdrawn, the resistance returned to its original value very quickly. The strip was then exposed to the rays coming from a Crookes tube placed at a distance of about 2 in, from it. The resistance rapidly diminished till it reached 34,000 ohms, small variations of the same taking place, which the author attributes to the variation of the intensity of the rays given off by the tube. When the tube was shut off the resistance of the strip gradually returned to the first value, it being remarked that this return was much slower than after the exposure to gaslight. The reduction of the resistance, of course, diminished as the Crookes tube was removed further away from the strip, but it was still appreciable when the tube was some 7 in. away from the strip. The interposition of substances more or less transparent to the cathode rays sensibly affected the reduction in resistance. The experiments were made in the physical laboratory of the university at Nancy.

> An interesting hydraulic plant has just been completed at Laxey, on the Isle of Man for working the electric railway between Douglas and Ramsey during the winter months. The plant has been in operation for about a fortnight, and thus far has given very satisfactory results. The principal advantage in the use of hydraulic power at Laxey, according to the London "Electrician," is that it enables the entire steam plant to be shut down for about seven months in the year, during which time the pressure of traffic is at a minimum.

> Two talking machines occupied the pulpit at Zion Tabernacle last Sunday afternoon at Chicago, and through them "Dr." J. Alexander Dowie, while resting quietly at White Lake, Mich., conducted service in Chicago. "Dr." Dowie's voice could be heard all over the auditorium. He not only preached to the congregation but announced hymns, made a prayer and gave out the regular notices.

> THE New York Fire Department is about to introduce an innovation in the way of a pocket telephone. The device is expected to facilitate and expedite the work at fires by placing the battalion chiefs in direct communication with headquarters, so that the size, extent and progress of fires can be reported without delay. The telephone is enclosed in a compact case of hardoak, covered with leather, and measures only eight inches in length, three in breadth and two and a quarter inches in depth. It is complete to the minutest detail. To get into direct communication with headquarters all that is necessary is to hang the telephone over the door of a fire box and insert a plug into a tapering hole in a block of brass within the box, thus completing the circuit.

"When I was in Chicago for a few weeks last summer," said a well-known electrical engineer recently, "the office building I was in was infested with rats. At my suggestion the owner of the premises placed two electric wires of opposite polarity across the rat holes in the basement in such a position that a rat must touch both in coming out. Some were shocked, but most of them were killed and the place was soon entirely freed from the pests. As you know, rats are sagacious and have a method of communicating between themselves and it is only necessary to give a few of them warning of impending danger to drive away the entire brood."

A Washington dispatch states that the House Committee on Claims has favorably reported the bill reimbursing the English Cable Company for the cutting of two cables by Admiral Dewey during the war with Spain, amounting to \$4,500.

THE British Admiralty, according to an exchange, has determined to fit several vessels of the Channel Squadron, viz., the Majestic, Magnificent, Hannibal and Jupiter, with wireless telegraphic apparatus on the Marconi system; and the signal boatswains of the two flagships and two petty signal officers on each of the ships in question are being instructed in wireless telegraphy on board the Hector at Portsmouth. It may be regarded as extremely probable that all the vessels of the British navy will eventually be equipped with wireless telegraphic apparatus.

THE electric railway between Burgdorf and Thun in Switzerland, mention of which has already been made in these columns, is nearly twenty-five miles in length, and the power station at Spies has four groups of turbine generators. The turbines operate under a head of 200 ft., and the maximum hp. obtainable is 6,300. Alternating current is generated at 4,000 volts and is raised to the transmission voltage of 16,000 volts by static transformers. The current is carried to 14 transformer stations by means of three copper wires of 0.2 in. diameter, carried on porcelain double-petticoated insulators, mounted on wooden poles. The transformers, which are oil-insulated, and have a capacity of 450 kilowatts each, are placed at the side of the track and are enclosed in metal housings with wooden shutters supported on concrete bases. On account of the use of the three-phase system two trolley wires are used, the rails, which are bonded, acting as the third conductor. The voltage of the current, as received from the transformers, is 750 volts.

An immense experiment is about to be undertaken at Wrightsville, Pa. To utilize the water power of the Susquehanna River, \$5,000,-000 is to be expended on a dam and dynamo outfit. York Haven is to be provided with a plant at almost equal cost and the two establishments are to supply power to trolley roads for the neighboring territory. Electric lighting and the furnishing of power to manufactories will also be a feature of the new business. The experiment ought to succeed; the success of the great Niagara Falls power plant is a strong augury that it will.

HAMILTON KING, Consul General for the United States in Siam, has sent the following report to the State Department from Bangkok: "There is an 8,000-light (incandescent) central station in Bangkok which was purchased in 1890 from an English company by a Siamese company, for the purpose of lighting the King's palace and for the use of the public. The plant was not operated until 1894, as the company met with financial difficulties, and finally it was turned over to Mr. L. E. Bennett, an American engineer, under a 20-year exclusive franchise to furnish light for the Government and the public. Since that time it has been operated fairly well by an American syndicate. This plant, which is at present valued at \$200.-000 in United States currency, has recently been sold to a Danish company, and will be extended and improved. Most of the supplies for these works have been puchased in Europe, but very recently several orders have been placed in America."



### THE FUTURE OF ELECTRIC ILLU-MINATION.

BY JEAN WETMORE.

#### PART V.

We have not been awake to the inefficiency of our high amperage lighting systems; we do not realize that less than one per cent, of the energy from a given source is actually utilized in an incandescent lamp in producing light, and this fundamental fact is ordinarily lost sight of by inventors and investors. There is a loss in the turbine water-wheel as well as by incomplete combustion in the boiler-furnace, a loss of energy by friction in shafting, heat radiation from boilers, pipes and the engine itself, and an immense amount of heat and unconsumed carbon goes up the smoke stack. There is back pressure in the exhaust of engines, there is a great loss in the conversion of mechanical into electrical energy, there is resistance in electric conductors, and there is an enormously greater loss of energy in producing heat in the incandescent lamp than is used in producing light; and then again there is a large apparent effective loss of light in the present method of suspending the lamps downward towards the center of the room.

The whole lighting system is full of holes through which leaks, at a conservative estimate, over 99 per cent. of our primary energy. Our systems of conversion are extravagantly wasteful.

It is said that our Western abattoirs utilize every portion of a hog, from its eye teeth through to its tail, except its squeal, and now it is proposed to make use of the squeal by a phonographic reproduction in childrens' toys. These economies should be an object lesson to electrical engineers.

The inventor who produces a two-candle-power light where there was but one before, will be a public benefactor, provided some one hundred million dollar electric trust does not pigenhole the patent to save replacing its present investments, or utilize the saving to pay dividends on highly watered stock.

As the primary object of this series of articles was to point out the defects of our present system of lighting, with special reference to lamps, wiring and the paraphernalia closely connected therewith, and their bearing on the electric illumination of the future, we will now, as a Frenchman would say, "return to our muttons."

The main object of living is happiness, and to produce discontent and dissatisfaction without trying to indicate the remedy would produce a bad impression. We well remember during our school days that one of the so-called evidences of a future life was the universal desire of the human race in that direction; for the last ten years our original electricians have been resting on their well earned laurels or have turned their efforts in other directions; radical improvements are not in order and we do not hear so much, nowadays, about electricity being in its infancy. Discontent is the forerunner of improvement, and we all know that necessity is the mother of invention. A carping spirit is not the incentive of the writer, but rather to emphasize deficiencies that improvements may be made. We must often tear down before we can build.

Inventors have struck a snag, as they are now often expected to deed over 97½ per cent. of their invention and all the improvements

they have not made, and do not own, to a promoter who has no money; in consideration of his promises to do something with an imaginary mysterious individual who has money; and though that imaginary being materializes, the harder the inventor works and the longer he wrestles with the money-power the less he receives, and finally another laurel wreath of bronze is seen in Greenwood cemetery and another batch of scientific dissertations are printed to be seldom read.

The electrical illumination of the future will probably produce a few more of these benefactors of the human race, these ill-starred "cranks" that turn the wheels of progress,

Our future improvements must fundamentally recognize vibrations as a basic starting point. Every particle of the universe is in a constant state of motion. One single particle in an absolute inert state would mean a universal smash up. Our senses recognize vibrations only; a certain number per second and we feel cold, a certain increase we feel heat, a larger number per second light, a still greater increase and all physiological sensations cease. Where there are a mixed number of vibrations of a certain number each per second, we perceive both heat and light at the same time.

When a piece of iron is placed in the forge it becomes hot; as the particles commence to vibrate faster, a dim glow appears; a further progressive increase in heat, the iron shows colors succeeding each other in a definite succession. The blacksmith takes advantage of this phenomenon to commence forging when the critical color is reached; if the iron is heated still hotter, it becomes incandescent and gives off a white light, thus color is also dependent on a difference of molecular vibration.

If colors depend on varying rates of vibration, and heat vibrations are slower than light vibrations and the iron could be prevented from disintegrating, could not the molecular vibrations be so increased as to be all of them beyond the heat vibrations, leaving nothing but a white light without heat?

This thought is pregnant with possibilities, but there are no practical possibilities in this direction with iron, granting the hypothetical question. The iron molecules are so closely matted together that they interfere with each other. They cannot be made for this reason to vibrate in unison, for some of the vibrations are slowed down and will produce heat, and they cannot from the nature of the substance be all whipped up to the point of unison and maintained at the concert pitch of white light. And so with most all material substances with which we are acquainted, and to such a general extent that we have not learned in common life to disassociate light from heat.

Light without heat is a consummation devoutly to be wished, for if we could electrically convert all the heat vibrations into light vibrations, a wonderful economy in light production would follow, being careful, of course, of not going too far and by so doing defeat our purpose. In this latter case light would vanish, and radiant energy of a different nature would appear—no, not appear, for it would be of itself alone beyond the reach of our senses. Our clay-fettered souls must wait until in that undiscovered realm from which no traveler returns new and higher perceptions are given us.

Astronomers tell us that interstellar space, blacker than Egyptian darkness, long fabled as the blackest of the black, is so because there is nothing in this space to give light vibrations, but nevertheless there are vibrations of some

kind that are supposed to reach us from the sun through this interstellar vacuum, and when these vibrations reach the outer confines of our attenuated atmosphere they are slowed down, and this retardation produces light, and finally as they come nearer the heavier atmosphere, and still nearer, among the atmospheric moisture and dust particles, some of these vibrations are so much retarded as to produce heat, and when they strike the dark earth they are converted in a large part into heat vibrations.

If we could go high enough we would perceive a cold light, a light at a temperature of about absolute zero, in fact plenty of light at a temperature far below anything that Tripler has produced by means of liquefied air. Nature has thus, at least, given us an analogy of light production without heat and furnished the raw material in most layish abundance.

All human achievements are but a manipulation of nature's forces; human as we are, is it not as much in the line of reason to retard vibrations and produce light, without wasting energy in producing heat, as to increase slow molecular action and get the same results with a great loss in heat? Is it not easier to pull down than to build up? Can it be possible that there are not some of these ultra light vibrations reaching us from the sun that are not all slowed down, that are not all strained out by our atmosphere, which we can manipulate by physical means? This is apparently placing the cart before the horse, but there are push carts as well as pull carts, and I believe this method of light production to be worthy of serious thought toward practical ends.

The Chinese produced a civilization long before we built up a civilization, by almost opposite methods. They had their day and we are having ours, and we may yet learn to manipulate vibrations in a direction diametrically opposite to our present well established methods.

### How the New York, New Haven & Hartford Railroad Proposes to Check and Utilize Waste Electricity.

Arrangements are being made by the New York, New Haven & Hartford Railroad Company to install a large electric storage battery at the Union station in Hartford, Conn., to be used as an auxiliary to the electric plant at Berlin for the operation of the the third rail electric system to Bristol, and for the further extension of the system to Rockville to accommodate the continual growth of travel from the suburban towns east of Hartford,

A large storage room is to be built under the elevated tracks adjoining the Union station. It is designed to receive the overflow of electricity which is not used by the cars, for, as often happens, the dynamos in the power house at Berlin are in operation when no cars are running on the system and all of the current now goes to waste.

It is intended that the new storage battery will absorb all of the spare electricity and apply it to the propulsion of cars when the current falls below the fixed standard, and especially in starting cars out of the Union station. An effort will be made in the installation of the battery to prevent serious losses of electricity which are now going on in some mysterious way, which the electricians of the company and experts who have been called in, have been unable to trace.

An officer of the company said that the losses



of electricity from the third rail system have charged the semaphore signals along the line, in the vicinity of the third rail, to such an extent that they are operated almost entirely by these stray currents instead of by their own chemical batteries. Speaking of the improvements which are being made in the application of electricity to the operation of railroads he said that where the third rail has been placed outside the track it has given better service, as in the case of the intramural railway at Chicago Fair in 1893, and the present system in use on the Brooklyn bridge. With the third rail between the tracks there is always danger of accidents occurring to a train, especially a freight, by a brake beam or other part of a car dropping onto the middle rail and carrying the current into the car and spreading it through the train.

With the third rail on the outside of the track regular freight and passenger trains may be run in the ordinary manner with steam without affecting or interfering with the electric system whatever.

#### **ELECTRIC TRACTION IN PARIS.\***

Many of our readers are aware of the rapid strides which the trolley system of electric traction has made in France. Since 1889, when the first line of this kind was laid, nearly every large town has adopted it, and there are now about 1,500 miles of trolley line in France. Despite the very many, and admitted, advantages of this system, a number of large towns, including Lyons, Nice and Bordeaux, have changed over, or are doing so, from the trolley to the conduit system, and in each case the same company has been given the contracts for the carrying out of these changes. The length of the line in Lyons is 8,600 meters (2.24 miles), and is in actual operation; whilst in Nice and Bordeaux the new lines are in construction, the lengths of line in these towns being 6,000 meters (3,73 miles) and 4,000 meters (2.49 miles) respectively.

In Paris some faddists thought, and these are the ones which prevailed, that the overhead trolley system disfigured the beautiful appearance of their public streets. Their objections have not carried permanent conviction for new lines recently opened and other lines now in construction are adopting the trolley system. The new line between the Bastille and Charenton opened up by the General Tramways Company of Paris is worked over nearly its entire length by trolley lines. In fact, of the 6,200 meters total length of line, 5,300 meters are trolley, and of this 3,500 meters are in Paris itself. The remaining 870 meters, divided up in two sections, one near Dumesnil, the other near the Place de la Bastille, are conduit lines.

The favor in which the new lines are held appears to be very high indeed. The suburbs have been made especially accessible, a fact whose appreciation is shown in the extraordinary increase in the number of daily passengers carried by this line before the transformation and now-from 6,000 to 30,000.

There are no fewer than ten different systems of mechanical traction in actual operation in Paris, but no one of them combines the conditions for rapid and frequent service with economical working and a tolerable remuneration to the shareholders. The experience of conduit construction in Washington, Budapest,

New York and Brussels is not unknown to French engineers, but its close study has been hindered by the large number of trolley lines already in existence in different parts of France. The main object of the present article is to explain a new system of conduit traction which has just been put in operation in Paris.

The General Parisian Tramways Company obtained a concession in December, 1897, for a line between Saint-Ouen and the Champ de Mars. By the conditions of the specifications. "underground electrical conductors" had to be used in that portion of it running through Paris, namely, from the Asnières gate to the Military School. The company were allowed to extend the line beyond the Gare Montparnasse, and it decided to extend right on to the Place de la Bastille, so that its conduit line might be operated by three distinct, lines: (1) On the Saint Ouen-Champ de Mars line; (2) l'Etoile-Gare Montparnasse line, and (3) on the Gare Montparnasse-Place de la Bastille line. The total length of these three lines is about

the rail head, because the wheels roll upon it. It must also be strong, and have considerable width at the point where it must be supported: with these conditions a mechanically satisfactory switch will give a slot of 14 in. to 2 in. at the point. The difficulty has been overcome in the Paris construction in a manner which will be described.

In the actual construction the two conduits are interiorly placed. The rails are held to gauge by tie-rods spaced every 2.10 meters, and the interior slot rails are similarly tied together. The details are very much the same as in other conduit systems. The laying of ordinary track is clearly shown in Fig. 1. The metal-work is tied together and accurately gauged. forms are then put into position and the conduit walls built up with concrete. The wooden road bed is then laid down, and the track is completed. Despite many extraneous difficulties which arose during construction, 100 meters of double track could be laid per day.

The above method of construction ensures

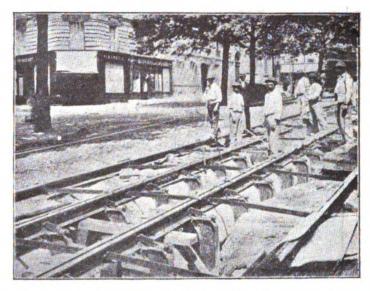


FIG. 1.—VIEW SHOWING CONDUIT LINE IN COURSE OF CONSTRUCTION.

7.5 miles, the lines (2) and (3) being formerly horse lines.

The conduits formerly built have all been with the center slot. The type of construction is that in use on the Metropolitan Railroad of Washington, the difference being that the cast-iron insulator shields are bolted directly to the bottom flange of the slot rail and the insulator pits are covered with a castiron plate, this being low enough to allow its being paved over. This avoids the use of manholes, against which there are many strictures.

In spite of strenuous efforts to do so, it was found impracticable, owing to the wooden payement, which wears so rapidly, to continue this central-slot construction in Paris. The proposition to add still another rail in the center of the track was therefore looked on decidedly askance, and finally the side-slot conduit was settled on. The chief objections to this system are: (1) The increased importance of slot closure, since the wheel flanges and plow must pass into the slot; (2) the whole weight of the car traffic is borne by the conduits, necessitating much stronger construction; (3) the splash of mud and water from wheels renders insulation of plow more difficult, and (4) it is absolutely impossible to make a really satisfactory slot-switch.

The last objection is very serious. A wide slot is necessary for the wheel flanges, and the upper face of the switch must be flush with great solidity. The swelling of the wood blocks will not affect the width of the slot, and the conduit is able to resist very great pressures; but not so for the rails. These, not being supported on a concrete bed, have experienced slight tilting. The use of wood pavement introduces the most complicated problems to the traction engineer; one never knows what bizarre effects may be produced. The inherent difficulties of the side-slot switch are avoided by the device of deflecting the slot to the center at such points. This construction is clearly indicated at the Etoile-Montparnasse terminus, Fig. 2, and represents a design which has been in use with success on the lines of the Lyons Omnibus and Tramways Company. The slot and track switches are thrown into position together by a pull on the detachable switch lever placed outside of the track. The arms which push the slot tongue are inclined to the slot. The plow in passing pushes them back under the slot-rail, the force required to do this being so very slight that there is no danger of damage to the plow or the carrier.

Across the Pont d'Alma, where the line crosses the Seine, the height of the masonry necessitated the construction of a special form of conduit, represented in Fig. 3. It consists of cast-iron tubes, strengthened by an exterior web every meter length. A special Z-bar is bolted to steel plates on the tube forming the slot rail. The rods are held in position by special

<sup>\*</sup>From the "Electrician," London.

steel castings acting as tie-rods. This construction necessitates the conductor bars being raised about 12 cm. (4%) above their level in the normal conduit. Special means are therefore required to raise or lower the plow for pasage over this bridge, independently of the arrangements for passage from the conduit to the trolley line.

The solution to the latter problem, obtained

These links absorb all the joltings and rough treatment of the rails, the mechanical strength of the springs being then unimportant, their function being simply to press the slots lightly against the conductor rail. The advantage of being able to raise or lower the plow at any point on the line had, in this design, to be sacrificed, though this advantage is probably exaggerated, for all that is really required is to

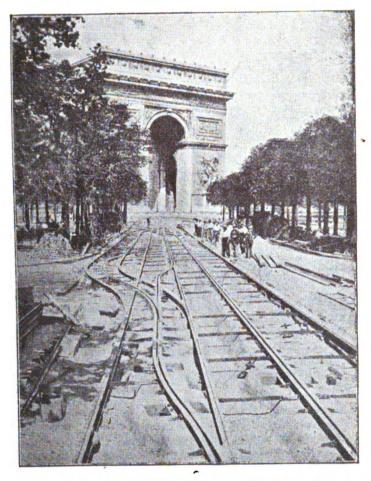


Fig. 2.— View of Etoile-Montparnasse Terminus, Showing Special Deflecting Device.

by arranging to attach or detach the plow, as the case may be, and in actual employ on two lines in the United States, is far too primitive to be satisfactory in cases where there is a frequent service. At Berlin, Brussels, and more satisfactory still, at Budapest, the most practical method was found to consist in providing

be able to make these changes at the junction of trolley and conduit sections.

The necessity for making a slot opening wide enough to permit of the free passage of the plow, and which could be rapidly opened or closed, was apparent. In the slot are placed two cast-steel covers supported on the one side

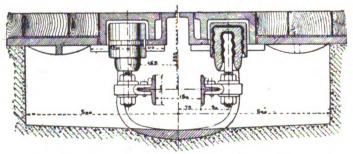


Fig. 3.—Shallow Conduit on the Pont d'Alma.

means on the car for raising or lowering the plow when necessary. The width of the slot required for this purpose becomes a very important consideration, and the design of the plow itself becomes serious. After careful consideration, it was decided to adopt the method now in use in Washington. This consists in making the plow in the shape of castiron shoes, which are pressed sideways by light semi-elliptic springs and supported on horizontal links which limited their outward play.

by a cast-iron frame and the ends by angle irons bolted to the slot rails. These covers are raised by a single motion of a removable lever outside of the track. The use of counterweights simplifies this operation. Sheet-iron guides are fastened to the conductor rails, and direct the shoes when the plow is lowered. The covers are opened by the conductor, who also raises or lowers the plow from the side of the car.

The most difficult problem consisted in the

design of the carrier. The conditions which this had to fulfill were: (1) The plow should be able to slide laterally right across the track; (2) it should be capable, when in its central position, of being withdrawn or introduced, as the case may be: (3) it should be raised or lowered from each of its side positions the necessary distance between the height of the conductor rails and the shallow conduit of the Pont d'Alma; and (4) at the contact points of trolley and conduit lines the same operation of raising or lowering the plow should also automatically change the circuits. The necessity for this change arises because the conduit circuit is a completely insulated one, while on the trolley the return is by the rails.

This plow is raised from its central position by a screw bolted to the side-bar of the track, and turned by the controller handle which simultaneously switches on the circuits by means of the bar attached to the commutators.

The "commutator" is in construction based on a car controller, with finger-tips, cylinder and spring to make a sharp break, so as to avoid destructive arcs. The entire lifting device differs from the type used on the Bastille-Charenton, Lyons and Nice lines, in that on these lines the lifting chains are attached directly to the plow. This cannot be used where the plow can shift the whole width of track, and the chains are therefore attached to a "cape," in which the plow slides. The design of the plow needed a special study.

There are numerous other points of interest connected with this line, but enough has been said to show that the line possesses many novel features.

### THE COMMON BATTERY SYSTEM.

[The New York Electrical Society held its 201st meeting on the 17th inst. at the Brooklyn Exchange of the New York & New Jersey Telephone Company. The Society was tendered a warm greeting by F. O. Runyon, chief engineer, and F. J. Southworth, traffic chief, who presented the following address.]

Gentlemen of the New York Electrical Society: In behalf of the New York & New Jersey Telephone Company, we wish to extend to you a cordial welcome, and to conduct you over the building, and describe such details of the plant as may require explanation.

All of the gentlemen present are doubtless acquainted with the history of the telephone: and it may be that all are familiar, in a general way at least, with telephone practice, past and present. But since the purpose of your visit is to inspect the common battery equipment recently installed in this building, it may not be amiss to briefly describe the common battery system and also the magneto system which has been superseded by the common battery in the Brooklyn, or as it is now called, the Main Central Office District.

By the common battery system is meant a system in which all the battery for supplying transmitting current for subscribers' telephones is located in the central office.

The common battery is also used for operating the signals at the central office, so that to call the office it is only necessary for the subscriber to remove the receiver from the hook. It also permits the use of signals in connecting cord circuits, whereby the supervision of connections is made automatic and is not attended by the continual listening-in of the operator to ascertain if the subscribers are through talking.

In this central office district to which about 3,000 subscribers are connected, the local battery has been removed from each subscriber's station, and current is furnished by a series of 11 storage cells of 1,250 ampere hours capacity located in the central office. Briefly, the method of operating for the old, or magneto system, is as follows:

The subscriber's station is furnished with a magneto hand generator, which, when operated by the subscriber, throws an annunciator drop at the central office. The operator makes the connection from the answering jack of this subscriber's line to the desired subscriber's line, using a pair of connecting cords. The pair of connecting cords also contains an annunciator drop which is thrown when the subscribers ring off, if they do not neglect that important item. If the desired subscriber's line is in another central office, it is of course necessary to complete the connection over a trunk circuit to that office.

All the large switchboards are of what is called the multiple type. In this type of board all of the subscribers' lines entering the central office appear in jacks about every 6 feet on the switchboard, so that all the lines are within the reach of any operator.

This central office has a common battery board of the multiple type, and on which the signals are lamps controlled by relays. A subscriber connected to this central office wishing to make a call removes his receiver from the hook. This lights a small incandescent lamp known as the line lamp, located next to the answering jack of this subscriber's line, immediately before the operator, who makes the connection with a pair of connecting cords in the same manner as in the magneto system, automatically extinguishing the line lamp. Each pair of connecting cords is provided with two keyboard signals which are miniature incandescent lamps, and by their being lighted or unlighted the operator can tell whether the subscribers connected on these cords have their telephones on or off the book. A lamp is lighted when the cord is connected to a subscriber's line and the receiver is on the hook. The lamp is extinguished while the telephone is off the hook, indicating that the line is in use.

In trunking between two common battery central offices this method of signaling is extended so that trunk operators are informed automatically when the trunk shall be disconnected. In the temporary conditions of affairs, when some exchanges are on the magneto system and some on the common battery system, the full advantages of automatic signaling cannot be obtained.

The underground cables carrying lines from subscribers' stations enter the building through iron pipes, and are connected to the main distributing rack on which the protective apparatus for the central office is placed. This rack has an ultimate capacity for 13,200 metallic circuits, and is arranged so that any pair of cable conductors can be cross-connected to any subscriber's line on the switchboard.

From the main rack, lead-covered, wool-insulated cables carry the lines to the intermediate distributing rack on the sixth floor, where the switchboard is located. The purpose of the intermediate rack is to enable subscribers' lines to be arranged in such groups on the switchboard as may be desired. On the same floor is a relay rack upon which the relays controlling the line and other signal lamps are placed. From the intermediate rack lines are carried through the multiple board in the less contains.

ing 64 wires each, with silk and cotton insulation. Cables containing 84 wires each also run from this rack to the answering jacks and signals.

The switchboard and auxiliary apparatus is designed for an ultimate capacity of 4,900 subcribers' lines and 950 trunk lines. It is at present equipped with 3,000 subscribers' lines and 500 trunk lines.

The repeating coils in the cord circuits are placed on the rack in the power room: in which is also located the units for charging the storage battery, the storage battery itself, and the motor-generators for ringing telephone bells and for other signaling purposes.

The storage battery has sufficient capacity to supply current for two or three days in case of a break down, and the charging sets and signal machines are in duplicates.

The power room also contains the wire chief's desk, to which all trouble is reported and from which trouble is located and the necessary directions given to the maintenance force in order to enable them to clear it.

The main operating room contains the main switchboard, the toll board and also desks of the manager, chief operator, etc. At the toll board calls for all points outside of Brooklyn and Manhattan Boroughs are handled.

#### CENTRAL STATION HEATING IN CON-NECTION WITH ELECTRIC LIGHTING PLANTS.\*

BY W. H. SCHOTT, Chicago.

One year ago we listened to a paper by Mr. J. H. Harding, on the subject of utilizing exhaust steam. This paper created more or less interest upon this subject and started a great many of us thinking.

In every manufacturing plant the shrewd manager is always trying to find some way of utilizing everything in the form of a byproduct that they may happen to have in their particular line and the up-to-date electric light manager should be on the same plane.

 $\Lambda$  few years ago investors believed that all that was necessary to draw large dividends was to purchase a certain kind of apparatus, put in most any kind of a steam plant and they would have a complete station and as soon as the light was turned on the dividends would begin to roll in, but later on some of these same investors found that instead of having a gold mine they were loaded with an elephant. They had been led to believe that they could put in any particular system, employ any novice to run same and it was all right, but later on they found that the expense kept constantly increasing, why they did not know. First one stockholder would try his hand at running it and then another and finally they would employ an expert to operate for them. This has been the experience of a number of plants throughout the country. Investors now know that in order to make an electric light plant pay it is necessary to construct it on the very best lines and then operate it accordingly. The average plant uses simple non-condensing engines and as a matter of course has a large number of heat units constantly going to waste, these heat units should be utilized and in most cases can be utilized if the proper apparatus is installed. What to install is an engineering problem that should be passed upon by some one competent to judge.

Within the last few years a few plants throughout the country have installed exhaust steam systems for heating, trying to secure a new earning power after having utilized the steam for the purpose of driving their electric load. After my own investigation of both the exhaust and hot water systems I was convinced that for certain cases the exhaust steam, either using back pressure on the engines or a vacuum pump, as the case might be, would be all right for certain cases, but where it required an extensive system to cover scattered areas it was impractical on account of the heavy investment required. But with the hot water system in towns where the business was located within two miles of the power station it could be taken care of from one power house at a minimum cost compared with a steam plant. The hot water system can be installed more cheaply than the exhaust steam as smaller pipes may be used to do the same amount of work, they repuire less expensive insulation, on account of lower temperatures the expansion is not so great, consequently less expansion joints are required, and with the hot water system heat can be stored up during such times when a surplus of steam exists and utilized when the amount of steam going to waste would be insufficient to do the required work.

To the consumer in addition to offering a uniform heat you can offer hot water for bath and laundry purposes, which will secure at least 30 per cent, of the business.

The average electric light plant in our smaller cities have had as a basis of starting a city contract. In this day and age we have to realize that we must put our plants where we are independent of a city contract, so that in case it is lost our business has not been destroyed and investment gone, and I do not know of a better way to do this than to put in a heating plant to utilize the exhaust steam, which is our by-product and by the proper disposal will increase our earning power and secure our investment and at the same time in so doing you are establishing something which every city is bound to have, namely, a central heating station.

## MODERN DEVELOPMENT IN A. C. SERIES ARC LAMPS.\*

BY R. FLEMING, Lynn, Mass

The development of arc lighting by means of alternating currents has been, all things considered, extremely slow. This is especially the case with arc lights in series.

Series lighting by direct current has, for many years past, reached a degree of perfection which, it is doubtful, can be improved upon, especially as regards the method of generating and distributing the current. Even in the years gone by, when methods and apparatus were crude, it was possible to obtain reasonably good services from such apparatus as could be secured, even taking into consideration, the fact that the attendance and care which the apparatus received was such as could be given by an extremely poor class of help. Now, however, men as well as methods have improved, and it is possible even for the small est central station to have its apparatus cared for in the most thorough manner. This, too, is made easier as the question of insulation and the handling of high potentials is now extremely well understood.

<sup>\*</sup> A paper read at the eighth annual meeting of the North-western Electrical Association, Milwaukee, Wis., Jan. 18, 1900.



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But even with the most perfect style of direct current apparatus obtainable there is yet a great deal to be desired in the way of flexibility of operation. It is necessary for high potential arc lighting work to have a small generating unit of comparatively low efficieny; this in turn to be driven by a small engine of low efficiency or a line shaft of still lower efficiency or by a synchronous motor, which latter method also has its disadvantages. It has long been the "dream" of a great many to be able to design a central lighting plant capable of furnishing all manner of light and power from a single unit or a single class of units of a size large enough to enable them to be operated under the most favorable conditions and at the highest possible efficiency, electrically and mechanically. While limited to direct currents for street lighting and series are lighting in general this "dream" was not easy of fulfillment.

The method of driving direct current are generators by means of synchronous motors supplied with current from alternating generators can hardly be called a method of lighting by means of alternating currents, being a complete regeneration of the current, and in fact, has many of the limitations of a system of are generators driven by small steam units. It is of comparatively low efficiency: there is a large amount of moving machinery that is quite complicated, requiring a large amount of floor space in the central stations as well as a large amount of extra attendance.

Series are lighting from alternating currents is not by any means of recent date. Experiments in this direction have been carried on from time to time ever since the oldest and crudest of alternating generators have been made.

Until recently, the most successful method was that of using a special alternating generator designed to have extremely high armature reaction separately excited and supplying open are alternating lamps. This method had all the disadvantages of a direct current system of distribution as well as a great many others inherent in the system itself. The generator, while theoretically ideal, was a very difficult machine to operate, and was of low efficiency. The power factor of the system was also low. The lamps were of a very crude design and extremely noisy; the light given off was of a poor quality and the operation of the lamps was anything but perfection.

Several schemes of supplying alternating arc lamps in series from constant potential circuits have been proposed from time to time, and several have been supplied to the market with varying 'degrees of success, few, however, reaching the point of becoming of any extended application, and most of them died in their infancy.

The advent of the constant current transformer and the alternating enclosed lamp have changed the whole aspect of series are lighting from alternating current circuits. With these transformers, it is possible to do anything that can be done with any form of direct current are generator. The regulation is as good or even better that can be obtained from these machines and this, too, is obtained without the use of complicated external means of accomplishing this end. These transformers possess the quality of "inherent regulation," which we occasionally hear so much talked about to a higher degree than any other class of apparatus made.

The principle on which the transformer operates is that beautiful one discovered and patented by Elihu Thomson a number of years ago. This was first brought to the attention of the public by his classic experiment with the floating incandescent lamp. No one can help being struck by the beauty and simplicity of this experiment.

In a constant current transformer the simplicity of the floating lamp is very nearly duplicated, except that the necessary leads are used to make connection with the moving coils, but these are so arranged that they are of the utmost simplicity of construction and in no way liable to become deranged.

In the practical application, all these transformer parts are reduced to a minimum and it is hardly possible to conceive a piece of apparatus that will accomplish so much with such an extremely simple arrangement of parts.

Here, it is perfectly feasible to completely short circuit the secondary winding of the transformer and without any further manipulation, apply the primary current at full potential without in the least damaging the transformer and with extremely slight disturbance to the circuit to which it is attached.

This device has several advantages over a direct current arc generator as a means of supplying constant current. In comparison, the efficiency is very much higher, even after taking into consideration the losses in the alternating generator, the combined losses being very much lower than is possible to obtain with the direct current machine of the best possible type. The alternating system admits of the use of extremely large units designed for the very highest efficiency and solves the problem of doing all classes of work both lighting and power from a single class of generators.

To appreciate the advantage of this thoroughly, it is only necessary to bring before your mind a few of the old time stations in which it was possible to find generated probably four or five separate and distinct classes of current for as many separate and distinct classes of work. We possibly had both alternating and direct current generators for lighting and a separate class of direct current generators for power work and in all probability two or more classes of arc generators, some supplying street lamps with 9,6 amperes, others supplying commercial circuits with a lower current value. All these units being of small size and mostly of a very inefficient type driven by inefficient steam engines and power consuming line shafts and belting.

The modern station, however, is a marked contrast to the above. Here, we have in the larger stations not more than five or six units of large size, the capacity being governed by the local conditions. These units are generally of the polyphase alternating type driven by a uniform design of compound or triple expansion steam engines, all of the highest possible efficiency. From these units power is supplied for all classes of work, transformed to suit whatever the conditions may be, whether for power, incandescent lighting or arc lighting-commercial arc lighting being done from the multiple circuits and street lights being supplied in series from constant current transformers. Nothing can be more simple, and I doubt if it is possible to obtain a more efficient and more satisfactory installation than one of the above type.

Regarding the lamps that have been designed from time to time for use on series alternating circuits—and their number has been legion; yet the lamps that have gone into actual commercial operation have been extremely few.

The difficulties in the way of making a satisfactory series alternating lamp have been very considerable. Several problems entering into the design which have made progress extremely slow. Owing to the nature of the current applied to the lamps, it was difficult to overcome the noise and vibration in the mechanism and the behavior of the arc itself, too, was extremely annoying, the quality of the carbon entering largely into the problem making experiments often hopeless. Altogether, experimental work on alternating lamps is the the most annoying and most unsatisfactory that one could possibly engage in. Now, I think however, that the problem has been fairly well solved, and even the very crudest of laboratory experiments have developed into a thoroughly satisfactory and commercial piece of apparatus, capable of doing its work equally as good if not better than the best direct current apparatus of a similar nature, it being only necessary to observe a very few and simple precautions to get results that are, to say the least, highly gratifying and satisfactory, both from an engineering and commercial point of view.

There are now in operation several thousands of these lamps in such positions, that if the work was not satisfactory they would not be tolerated for a moment.

That the alternating lamps are successful as a means of street lighting, goes without saying. This is testified to by the large number which have been placed in operation during the past year. The objection that has been held against the alternating lamp, for a long time—that they did not give nearly as much light as the direct current lamps, has not been substantiated, for with an equal amount of energy, the alternating lamp is fully the equal if not the superior of the direct current lamp, especially for street lighting, owing principally to the improved distribution of light from the alternating arc.

This subject has been gone over fully during the past year and is now pretty well understood and no fears need be entertained that the alternating lamp is not efficient.

After development of any device or system in the laboratory, the next step is the practical application of such a device or system and there is often more credit due the man who first risks his money and his reputation for good service to his customers than to the man who does the actual development of such a device or system and in this particular instance too much honor and credit cannot be given to the management of the Hartford Electric Light Company, who, in view of the fact that here was a system commercially unknown and untried, risked an expenditure of a large amount of money and time, and bore with a considerable amount of trouble and experimenting and were broad minded enough to see that the system had very great possibilities, and in case success offered them very marked advantages over their old system or any system that they had then investigated. But withal, it is only justice to the system to say that the loss from lights out was extremely small. Minor troubles of course developed and were remedied in short order and now that the installation is complete with the most modern apparatus, the operation is satisfactory in the extreme. The capacity of the installation is in the neighborhood of 700 lights with practically no relay in case of accident, the trans-



formers being sub-divided and placed in substations, yet so much confidence had they in the system that they did not consider it essential to provide against accidents or breakdowns

It may be interesting in this connection to know one proposition that has been made. It is to mount a tranformer on a truck, this is to be stored at some convenient point, when, in case of accident, a team can be hitched on and driven to points where trouble has occurred.

So far, this has not been put into practical operation, yet it has all the essentials of success and is a scheme that has considerable merit and in my mind would be an excellent means of providing relay in case of break-The possibility of breakdown, however, is extremely remote as, owing to the construction of the transformer and the provision made against accidents due to either internal strains on the insulation or the possibility of damage by lightning, the probable use of a relay unit would be extremely limited.

It may be interesting, from a financial standpoint, to learn that a certain lighting company estimates that, owing to savings made by the use of this system over their old system of street lighting by means of open are lamps supplied by the old style are generators, these latter being driven by small engines and line shafting, the new system will pay for itself within two years, that is to say, by the sayings made, they will be enabled to charge the first cost of the entire system off their books. This, in many respects is a remarkable statement to make, but I have it from the officers of the above company that this is a very conservative statement, and, as a matter of fact, will be bettered to some extent.

Regarding the cost of operation of these lamps, which perhaps is the most interesting subject for the central station, the cost of operating multiple lamps, both alternating and direct is very well understood owing to the fact that these lamps are in very extended use, and there is scarcely a central station in the country which has not a comparatively large number of either one kind or the other. The cost of operation of the series alternating system is very nearly the same as regards the labor for trimming and the cost of carbon as in other enclosed arc lamps. It is very difficult to compile any definite figures on this subject or to make any definite statement as the costs vary within extremely wide limits dependent upon local conditions.

The actual figures in detail are not available but in a number of cases it has been estimated that changing over from the old method of lighting to the new, a saving of from \$8 to \$10 and in some cases as high as \$12 per lamp per year has been made. The principal saving lies in the fact that the cost of trimming and maintenance of the lamps is reduced wonderfully. With the new system one man is abundantly able to take care of 600 lamps where it required six men to take care of an equivalent number of lamps on the old system. In this way it is possible to employ a much higher grade of workmen, thereby insuring that the lamps are properly cared for, which, with the enclosed lamps, is a very important item as in this point alone lies a considerable portion of the success of this class of apparatus. A careless lamp trimmer can easily spend his salary many times over and the operation of the lamps trimmed by such a man will be anything but perfect. With careful handling, the life of the lamps will be extremely uniform and need not be

trimmed oftener than once per week under the most severe winter conditions, whereas, with careless trimming, the globes are not made tight, the carbons are cut of varying length, thereby destroying the principal advantages of the enclosed system.

The question of globe breakage is also a much mooted one. This expense also is variable as the following tables show. The figures given were received from a number of representative central stations and isolated plants throughout the country. They cover nearly all forms of enclosed arc lamps, and also represent nearly all degrees of care used in trimming.

INNER GLOBE BREAKAGE.

Direct Current	Arc	Lamps.
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D. C. C.	Amperes	Per trim, per cent.
$\Lambda 650$	` 5	214
B 270	7	51.
C 260	6.6	434
D 825	6.6	3.
	Commmer	
E 3000	City Mark	
	/ Residentia	1 2 to 3
F 150	6.6	31/6
G 61	6,8	. 18
H 175	5	1
I 50	4.8	6
J 600	6,6	6.6
K 200 mult	. 5	5140
L 10	5	51. <u>5</u>
M 1800	416	41.5
N 160	214	Satisfactory.

INNER GLOBE BREAKAGE.

#### Alternating Current Arc Lamps.

A	lt. C. C .	Amper	res.	Per trim, per	r cent
0	35	6.6	(1 globe	in 4 months)	.18
P	47	6.6			41.4
Q	1:27	6.6			3
R		6,6		About	4
S	Sin alt.	mult, 6			5L.,
Т	1200 **	7.5			516

It will be seen from the foregoing that no definite figures can be arrived at. A great deal depends upon the care with which the trimming and the cleaning of the globes is performed. The energy consumed by the lamp seems to have but little bearing on the globe breakage, as the life of the globes on lamps burning at 7 or 7½ amperes and consuming 500 watts or over, is as good as those on the 41 or 5 ampere lamps that only consume 350 to 400 watts.

The question of the proper amount of energy that a street light should consume has provoked a good deal of discussion in the past nor does it seem to be permanently settled yet, although a current of 6.6 amperes with an arc adjustment of 70 volts seems to be almost universally satisfactory. The volume of light from such a lamp is certainly large enough for general street illumination, and even for certain severe conditions where a greater amount of light is required, it is a far better plan to increase the number of lamps rather than increase the power of the lights themselves by increasing the energy supplied to each. The alternating series lamp consuming 425 to 450 watts seems to be a satisfactory unit, both to the central station managers and city officials, wherever they have been used, giving an almost ideal distribution of light of the finest quality, being remarkably steady and of good color and penetration.

#### New Telephone Cable.

A scheme is being mooted to lay a telephone cable across the Bay of Fundy, from St. John, New Brunswick, to Digby, Nova Scotia. The distance to be covered by the cable is 45 miles, and it will connect at Point Prim, Digby county, with the wires of the Valley Telephone Company of Nova Scotia.

#### CANADIAN NOTES.

(From our Ottawa Correspondent.)

The owners of the Velvet mine propose constructing a railway from Rossland, British Columbia, to the mine. It has not yet been decided whether the motive power will be steam or electricity, a director of the British Electric Company now being on his way from England to determine this point.

At a meeting of the city council of Toronto, Ont., held on Jan. 22, a notice was given by the mayor that he would move that the council petition the Parliament of Canada, at its ensuing session, to pass an act to authorize the Post-master General to acquire all of the existing telegraph and telephone lines and systems, and make such extensions to and operate the same in connection with, and as part of, the postal system of Canada, or in the alternative to construct a new system or systems of telegraph or telephones, and operate the same, and that the co-operation of the cities, towns and other municipalities of the Dominion be invited to the end that an act may be passed for these

A report comes from Palm Beach, Fla., that Mr. A. F. Gault and Mr. Wm. M. Doull, both of Montreal, have returned from a trip to Cuba and that these gentlemen have secured control of the surface railway of Havana. As a matter of fact the concessions, in which the Canadians are interested, were obtained months ago, and in this company Mr. Doull is a direc-

It is understood that the Montreal Electric Street Railway Company is negotiating with the Chambly Water & Power Company for the supply of electric power in the operation of the railway company's system, and that this corpo-tion will acquire a good sized lump of the Chambly Company's stock.

A new method of generating water gas for lighting and heating has been discovered by W. H. Cone, of Ottawa, and the discovery has already been put to practical use and an apparatus installed in the city for making the under the new system. By this new method hydrogen is generated by the decomposition of water by electricity and made to permeate coal oil or any heavy carbon oil. In this way the hydrogen becomes carbonated, and when mixed with air makes an illuminating gas of first quality. It can be produced at 40 cents per quality. It can be produced at 40 cents per 1,000 feet. While Mr. Cone will not yet make known the secret of his method for manufacturing the gas, there seems to be little doubt as to the success of his system. A company is now being formed, with a capital stock of \$100,-000, to operate the system. Mr. Cone is a chemist, and stumbled upon this new method of generating the water gas while he was endeavoring to find a means of generating oxygen for medicinal purposes.

Electrical industries in Canada, have fully shared in the general prosperity that is now felt throughout the Dominion. It is stated that the leading electrical manufacturing and supply companies report that the volume of their business for 1899 exceeded by upwards of per cent. the business done during 1898. More than half of the output of these companies was applied to the extension and improvement of the existing plants, the bulk of the machinery sold being for lighting and power purposes. Many electric lighting companies took advantage of the prosperous times to discard old-type machinery and replace the same with new apparatus of higher efficiency. Improvement and development have been quite as marked in the commercial as in the mechanical field. The business done has been so large and so profitable that the stock of the two leading manufacturing companies in the two leading manufacturing companies. Dominion has risen 50 points during the year, and further advances are predicted. The workshops of the electrical manufacturies are to be crowded with orders to such an ex tent that no promise of delivery at a specified time can be made, and prices are firmly main tained. The outlook for the current year is everywhere regarded as most promising.

#### AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

#### The Council Vote to Hold the Next General Meeting in Philadelphia.

The 139th meeting of the American Institute of Electrical Engineers, was held at 12 West 31st street, New York, on Wednesday, January 24, President Kennelly in the chair. 75 members and guests being present. A paper was presented by Mr. Fitzhugh Townsend, of New York City, on "A New Method of Tracing Alternating Current Curves," The discussion was opened by Dr. Sheldon and continued by Mr. C. P. Steinmetz and Dr. M. I. Pupin. A paper was also read by Mr. Chas. P. Steinmetz, of Schenectady, entitled "Notes on Single-Phase Induction Motors and the Self-Starting Condenser Motor." Messrs, Pupin, Bradley and others took part in the discussion.

At the meeting of council held in the afternoon, the President announced the death of James Hamblet, formerly a vice-president and manager of the Institute, also of Samuel Dana Greene, who at the date of his decease was serving the first year of his term as manager. The President stated that he had appointed committees to prepare suitable resolutions and memorials to be printed in the Transactions,

It was voted to hold the next General Meeting of the Institute in Philadelphia which should adjourn to meet in Paris on August 16. The date of meeting in Philadelphia was not fixed. Over 60 members have promised to attend the European meeting. An appropriation of \$500 was voted for erect-

ing shelving and the binding of periodicals now on file at the Institute rooms.

The following associate members were elected:

Bernard A. Behrend, Erie, Pa.

Edmund Walter Beveridge, Bombay. India. John Denham, Cape Town, South Africa.

Paul H. Evans, Harry B. Niles, J. Harry Shearer, Robert R. Shephard, Milton T. Thompson, Mexico City, Mexico.

George Greenwood, Jalapa, V. C., Mexico. Gwyllym R. Holmes, Baltimore, Md.

J. E. Hindon Hyde, Benjamin Magnus, New York City.

Alois J. J. Pfeiffer, Milan, Italy.

Charles Oscar Poole, San Francisco, Cal.

Wilfred Van Nest Powelson, Schenectady,

Frederick Alexander Saylor, Reading Pa. R. L. Selden, Jr., Deep River, Conn. Max W. Zabel, Chicago, 111.

The following associate members were transferred to full membership:

Walter Donglas Young, Baltimore, Md. Robert T. E. Lozier, New York City. H. A. Storrs, New London, Conn.

#### Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended January 20:

Argentine Republic, 305 cases, \$15,031; Barcelona, 46 cases, \$5,155; Berlin, 1 case, \$5; Brazil, 10 cases, \$227; British Australia, 1 case, \$198; British East Indies, 17 cases, \$607; British West Indies, 22 cases, \$228; Central America, 117 cases, \$840; Genoa, 4 cases, \$8,000; Hamburg, 99 cases, \$2,722; Havre, 248 cases, \$16,164; Japan, 51 cases, \$8,408; Liverpool, 139 cases, \$5,567; London, 402 cases, \$15,662; 7 electrical carriages, \$823; Nice, 66 cases, \$11,283; Peru, 21 packages, \$657: Santo Domingo, 27 cases, \$1,018; Southampton, 88 cases, \$3,703; Stockholm, 1 case, \$20: Venezuela, 21 cases, \$559; Vienna, 5 cases, \$195.

The following were the exports during the week ended January 27:

Alexandria, 1 case, \$20; Amsterdam, 1 case, \$125: Argentine Republic, 288 cases, \$24,364: Australia, 2 cases, \$1,133; Brazil, 8 cases. \$460; Bristol, 62 packages, \$4,000; Brussels, 1 package, \$22; Central America, 3 cases, \$101; Cuba, 140 cases, \$4,449; Dutch Guiana, 1 case, \$50; Fredrickstad, 5 cases, \$140; Glasgow, 6 cases, \$211; Hamburg, 139 cases, \$10,819; Leeds, 3 cases, \$181: Liverpool, 6 cases, \$223: Mexico, 12 cases, \$1,226; Milan, 19 cases, \$1,716; Newcastle, 5 cases, \$670; Riga, 7 cases, \$1,558; Rotterdam, 1 case, \$15: Southampton, 2 cases, \$40; Tasmania, 53 packages, \$3,310.

#### LEGAL NOTES.

Justice Wilmot M. Smith, of the Supreme Court at White Plains, N.Y., has decided that the New York, Westchester & Connecticut Traction Company has no rights in the town of East Chester or the village of Bronxville. This gives the Union ("Huckleberry") Railway Company the right to proceed and complete its road from Mount Vernon to White Plains, a part of which, from Scarsdale to White Plains, is already built and in operation Plains, is already built and in operation.

The Supreme Court recently handed down a decision in the Des Moines, (Ia.) municipal electric light case. The court holds that the city of Des Moines, in contracting with the McCaskey & Holcomb Company to erect a city electric lighting plant, exceeded its proper authority in that it engaged in a contract which imposed on the city liabilities in excess of the constitutional limit of debt. The contract is, The contract is, therefore, held null and void,

## PERSONAL MENTION.

Mr. John J. Tonkin was recently selected as consulting engineer of the Murphy Safety Third Rail Electric Company of New York City.

 $\mathbf{Mr.~E.~W.~Goss.}$  for the past four years superintendent of the Middletown (Conn., Street Railway Company, has accepted the position of superintendent of the Milford, Holliston & Framingham Street Railway Company in Massachusetts.

Prof. David Edward Hughes, inventor of the Hughes printing telegraph instrument, now in use on all important Continental lines in Europe and on all submarine lines between England and the Continent, is dead. Prof. Hughes was born in London May 16, 1831, and was educated at Bardstown College, Kentucky. He was the inventor of the induction balance, and the discoverer of the microphone, now almost universally used as transmitter to the telephone. He was the author of numerous papers upon electricity and magnetism.

#### INCORPORATIONS.

The Washington Light & Power Company, Washington, Ind. Capital stock, \$21,00c.

The Fowler Electric Company, Fowler, Ind. -to operate an electric light plant. Capital stock, \$25,000. Incorporators: C. C. Curtis, H. B. Mersh. E. M. Campbell and J. W. Noel, all of Fowler.

The Seattle Electric Company, Seattle, Wash. Capital stock, \$6,250,000. Incorporators: Jacob Furth, M. Micken, T. Burke, C. J. Smith and R. V. Ankeny, all of Seattle.

The Maumee Electric Company, Maumee, O. to furnish electricity for light, heat and power. Capital stock, \$7,500. Incorporators: W. R. Tryon, W. S. Swan, G. B. Monen, A. C. Tryon and A. E. Tryon,

The Acme Electric Company, New York City-to manufacture and sell electrical apparatus. Capital stock. \$25,000. Directors: George H Crossman, Louis A. Jackson and Charles A. Secor of New York City.

The Cedar Rapids Electric Light & Power Company, Cedar Rapids, Ia. Capital stock, \$500,000. Incorporators: C J. Ives, I. B. Smith, J. H. Smith, W. G. Dows, W. D. Douglass and W. J. Greene, all of Cedar Rapids.

The Porter Motor Company, Portland, Me,-to manufac-

ture and deal in automobiles and motors. Capital stock, \$1,000,000. Officers: President, Major D. Porter of Boston, Mass.: treasurer, Dalton Fallon of Brookline

The People's Light, Heat & Power Company, Wilmington, Del.-to manufacture gas, steam and electricity for lighting, heat and power. Capital stock, \$2,000,000. Incorporators V. H. Conkle, T. F. Deegan, both of Philadelphia, Pa., and P. J. Ford of Wilmington.

The Coeymans Electric Company, Albany, N. Y.--to manufacture electricity for light, heat and power purposes in Albany and Greene counties. Capital stock. \$50,000. rectors: William F. Inman, John N. Drake, of New York City; John F. Montignani, of Albany; Levi E. Conyes and Charles L. Diston, of Ravena.

The Washington, Mechanicsville, Leonardtown & Point Lookout Electric Railway Company, Annapolis, Md.-to build an electric railway from Washington through Prince George's, Charles and St. Mary's counties to Point Lookout. Capital stock, \$1,000,000. Incorporators: C. R. Jones and F. R. Tenney of Philadelphia, Pa., J. T. Ballinger, G. F. Dyer and others of Maryland.

#### ELECTRICAL PATENT RECORD.

[ This department is edited by OSCAR A MICHEL, Solicion and Attorney for AMERICAN AND FORFIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N W., Washington, D C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A MICHEL Nos 302 301, Broadman New York City N. Y , or 639 F street, N W , Washington, D. C. Copies of any patent published c n be furnished upon p ment of ten cents. When ordering give name, date and tile of invention wanted.

#### LETTERS PATENT ISSUED JANUARY 25, 1900.

## ELECTRIC RAILWAYS AND APPLIANCES.

641,829. Electric Overhead Railway. Louis J. Bruns and Plans R. Ottesen. Hanover, Germany. Filed Aug. 15,

1899.
641.843. Pneumatic Controlling System for Electric Railway Cars. William Cooper, Cincinnati, O., assignor of five-sixths to Blood & Hale, Boston, Mass. Filed June 23, 1899.

1898, 641,879. Surface Contact Electric-Railway System. John M. Murphy. Torrington. Conn., assignor to the Safety Third Rail Electric Company, New York City. Filed Feb 7, 1899. 642,008. Car-Brake. Peter Schrieffer, New Orleans, La. Filed Aug. 26, 1899.

#### ELECTRIC LIGHTS AND APPLIANCES.

ELECTRIC LIGHTS AND APPLIANCES.

641,748. Adjustable Bracket. Theodore Smith, Georgetown, Ill. Filed Feb. 20, 1889.

641,891. Electric Arc Lamp. Edwin W. Rice. Jr., Schenec tady. N.Y., assignor to the General Electric Company of New York. Filed Aug. 7, 1889.

641,957. Electric Lighting Apparatus. Gustavos Heidel, St. Louis, Mo., assignor to the Globe Electric Company, same place. Filed Feb. 20, 1899.

641,958. Pencil for Electric-Arc Lamps. Gustavos Heidel, St. Louis, Wo., assignor to the Globe Electric Company, same place. Filed March 16, 1899.

#### ELECTRICAL MACHINERY AND APPARATUS.

641,682. Dynamo-Electric Machine. William L. R. Emmet. Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Dec. 16, 1888.
641,927. Quick-Break Electric Switch. William F. Bossert and George L. Holton, Utica, N. Y., assignors to the Bossert Electric Construction Company, same place. Filed New Action Company.

March 7, 1899.

#### TELEPHONES AND TELEPHONE APPARATUS.

641,721. Telephone-Exchange System. Frank R. McBerty. Downer's Grove, Ill., assignor to the Western Electric Company, Chicago, Ill. Filed Nov. 24, 1896.
641,737. Registering Apparatus and Circuit for Telephonic Measured Service. George K. Thompson, Malden, Mass., assignor to the American Bell Telephone Company, Boston, Mass. Filed June 15, 1899.
641,743. Telephone-Switchboard Apparatus and Appliance, Thomas C. Wales, Jr. Newton, Mass. Siled July 5, 1899.

#### MISCELLANEOUS.

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641,767. Method of Electric-Arc Heating and Apparatus Therefor. Hermann Drosse, Berlin, Germany. Filed Dec. 13, 1898.

641,820. Electric-Vizing Apparatus. Wilfred Barnes. Lynn, Mass. Filed Jan. 17, 1898.

641,890. Electric Foot-Battery. David W. Prosser, Jamestown, N. Y. Filed Nov. 6, 1899.

641,890. System of Electrical Distribution. Charles P. Steinmetz, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Sept. 30, 1899.

641,916. Printing-Telegraph Instrument. John E. Wright, New York City. Filed May 5, 1899.

641,930. Electric Fire Alarm Box. Henry F. Blackwell, Jr., New York City. Filed Aug. 24, 1899.

641,930. Electric Fire Alarm System. Manious Garl, Akron. O. Filed Sept. (2, 1890.

641,956. Downdraft Electrical Furnace, Robert H. Laird, Pattsburg, Pa. Filed July 24, 1897.



### GENERAL NEWS.

What s Going On in the Electrical World.

#### LIGHTING.

Abbeville, I.a.—J. Maxwell and W. Porter propose the formation of a company to build an electric light plant at this place.

Asbury Park, N. J.—A new electric lighting plant is contemplated for this city by Asbury Park authorities. It will be equipped with three augines and three dynamos of 70 lights' capacity; one additional beiler of 100 horse-power will also be required. Cost, \$25,000.

Baltimore, Md.—The Heiser Manufacturing Company intends installing a 200-light dynamo with wiring, etc. Address W. E. Heiser, president of the company.

Batavia, O — On February 3 the citizens will vote on the proposition to issue bonds to build an electric light plant.

Bloomington, Ind.—The citizens of this place are agitating the question of building a new electric light plant.

Cape May, N. J.—The citizens of this resort want the right to issue bonds for the construction of a municipal electric light plant.

Celina, O —The citizens of this place are agitating the question of erecting an electric light plant.

Central City, Col.—The Long's Peak Power Company will soon erect a new electric light plant for supplying electricity for light and power purposes to the towns and mines in this portion of the State. It will be located about 3) miles from this city.

Chasks, Minn.—This city by a public vote has decided to put in an electric light plant. Bonds will be issued for \$7,000, that being the estimated cost of the niant.

Chenoa, Ill.—The Chenoa electric light plant is to be enlarged.

Chittenango, N. Y.—Surveyor E. D. Smalley of Utica has been suggesting the establishment of a waterworks system and electric light plant in this place.

Coldwater, Mich.—The city council will soon purchase another dynamo for the city's electric light plant.

Covington, Kv.—Sealed bids will be received by the city clerk up to 5 o'clock PM, February 5, for the franchise or privilege of entering in and upon the streets, alleys and highways of the city, to erect and maintain poles, wires and appurtenances for furnishing electric ity to consumers for a term of twenty years from the date of the granting of this franchise.

Dongola, Ill.—This town contemplates putting in an electric light plant in the near future.

Grayson, Ky.—The citizens will vote on the question of issuing bonds to build an electric light plant.

Hagerstown, Ind.—Municipal waterworks and electric lights are improvements contemplated for this place the coming season.

Hoboken, N. J.—The Municipal Light, Heat & Power Company has applied to the common council for the privilege of erecting poles and placing conduits in the streets for supplying the city and citizens with light, heat and power.

Jennings, Lt.—At a recent meeting of the council B 8 Stearns was granted a franchise to put in an electric light plant here.

La Crosse, Wis —The proposition to construct a municipal electric light plant was carried almost unanimously at the recent election.

Lubec, Me.—The Sea Clast Packing Company contemplates the installing of a general electric system or independent plants, which ever may appear the most expedient, for the lighting of their factories in this place, for the coming season.

Ludington, Mich.—The common council has been petitioned by the residents of the city to order a special election on February 5 for the purpose of voting upon the proposition to issue \$25,000 in bonds for the erection of an electric lighting plant.

Mars Hill, Me.—There is talk of putting in an electric light plant at this place in the near future.

Bichmond, Ind.—The city council is in favor of the municipal ownership of an electric light plant.

Shepherdstown, W. Va.—Dr. A. S Reynolds of this place is making an investigation of the cost of an electric light plant with a view to operating the same hare.

Sherburne, Minn.—W. F. Brundage is looking over the field with a view to putting in an electric light

Shippensburg, Pa.—The citizens are agitating the question of issuing bonds for the purpose of erecting an independent electric light plant.

Spencerville, O.—The citizens will petition the council to put in an electric light plant.

Versailles, Ind.—Grant Johnson is the promoter of an electric light plant, which is to be erected here in the spring.

West Union, O.—Local capitalists are organizing to put in an electric light plant.

Winona, Miss.—A stock company with a capital of

\$21,000 has been formed by business men of this place for the purpose of erecting an electric light plant.

#### STREET RAILWAYS.

Atlanta, Ga.—A stock company, of which Attorney General Monnett is one of the incorporators, has just been organized to construct an electric road from this city to Douglasville, a distance of 45 miles.

Carthage, N. Y.—The prospects for a trolley line between Watertown and this place are said to be very encouraging.

Cleveland, O.—Cleveland promoters are interested in a new \$600,000 street railway project in Indiana. The road is to be 49 miles long and will run into Indianapolis. Capitalists of Kokomo are interested and also the United States Construction Company of this city.

Columbus, O.—The Lancaster & Newark Traction Company proposes to construct and operate an electric railroad line passing through the Licking reservoir and towns and villages that skirt its shores. E Rowles, S. B. Campbell, E. H. K.bbler and others are interested.

Fayetteville, Pa.—Amos B. Lehman of this city is interested in a company that is to be organized for the purpose of constructing an electric street railway between this place and Chambersburg.

Fitchburg, Mass.—Among the latest railway schemes is the opening of an electric line up Wachusett mountain, in which enterprise electric road men of this place and Leominster are interested.

Huntsville, Ala.—John H. Waters, treasurer of the Huntsville Railway, Light & Power Company, states that the company will probably run an electric railway to North Huntsville.

Nashville, Tenn.—J. S. Brown and others are interested in a proposed electric line in the northestern part of the city.

Neenah, Wis.—Preliminary steps have been taken for the organization of a company to build an interurban line along the east shore of Lake Winnebago from here to Fond du Lac.

Oil City, Pa.—The Oil City Traction Company has been granted a franchise and charter to build an electric street car line in this city.

Phoenix N. Y — Mr. Hart of Syracuse in the interest of the Oneida Lake Street Railroad Company is planning to build an electric road between this place and Syracuse.

Portland, Ind.—A company has been formed to construct an electric railway to extend from Huntington to this place. The line will pass through Kelso, Warren, Montpelier and terminate at Portland. The promoters are Mayor Z. T. Dungan, J. F. France and I. F. Beard of Huntington. Franchises will be asked for from the commissioners in Huntington, Grant, Blackford and Jay counties.

Richmond, Ind.—It is proposed to construct an electric street railway from this city to Eaton, O. The right of way has been secured and capital has been raised to build the line. Dr. W. Lowes and other D-yton capitalists are interested. The company will be capitalized at about \$200,000.

Tacoma, Wash.—The Dyea & Chilcoot Railroad Company proposes to build an electric road from Dyea to Chilcoot Pass, in Alaska, a distance of seventeen miles. Michael King is president and T. B. Wallace of this city is secretary.

Waterbury, Conn.—The Connecticut Lighting & Power Company is to open up a through trolley line from this city to Hartford in the near future.

Z snesville, O—A company has been organized for the purpose of constructing and operating an electric railway between here and Coshocton, the line is to run through Sonora, Esst Greenwood, Adamsville, O.sego and Piainfield. F. H. Southard, H. E. Burker and J. B. Wilson are the incorporators.

#### COMPANY MATTERS.

Allentown, Pa.—A movement is on foot looking forward to the consolidation of the interests of the Allentown and Kutztown, Kutztown and Fleetwood and Kutztown and Beading Electric Railway Companies. The men interested in the enterprise are leading citizens in towns along the route of the proposed roads.

Belvidere, Ill.—A. J. Stahl has purchased the stock of the Belvidere Light. Heat & Power Company. W. H. Schott and E. B Magill are also interested. The new company will enlarge the plant.

Cincinnati, O.—The Cincinnati Edison Electric Light Company has purchased property on Fifth street, for \$48,000 and will build a mammoth plant.

Easton, Pa —At a recent meeting of the city council representatives of the Easton Power Company stated that preliminary arrangements looking to the absorption of the Edison Illuminating Company of Easton, a rival, had been made and that the final transfer would take place February 1.

Fort Lee, N. J.—It is reported that the Bergen County Traction Company, which has owned the trolley through this place and the Riverside and Fort Lee Ferry Company have combined, and that both are being operated under the real management of the Third Avenue Road in New York, which, it is said, has secured a controlling interest in both the Fort Lee Trolley Company and the Fort Lee Ferry.

Mobile, Ala.—The Electric Lighting Company will

elect additional buildings for their power plant, adding an engine of 600 horse-power a d capacity for 6,000 additional lights.

Muncie, Ind.—Fire destroyed the power house, shops, harns and offices of the electric street railway system. Loss, \$93,000. The plant will be rebuilt.

New York.—The following electric car lighting and equipment companies were merged into one company last week with a capital of \$16,000,000: The Electric Car Light & Power Company, the Columbian Electric Car Lighting & Brake Company, the American Railway Electric Company, the United Electric Company, the Lindstrom Brake Company and the Railway Triplex Ticket Company. The new corporation will be known as the Consolidated Railway Electric Lighting & Equipment Company, and is incorporated under the laws of New Jersey. Mr. Isaac L. Rice will serve as president.

Troy, N. Y.—The E. G. Bernard Company has recently shipped an electrical plant for the Government Grounds at Key West, Fla. The plant will furnish lights for the fortifications and will supply current for firing the large coast defence guns at that station.

Watertown, N. Y.—The Black River Traction Company has purchased through C. M. Paris, water power at Felt's Mills for a power s'ation in that village.

Worcester, Mass.—The Worcester Electric Light Company is contemplating putting its wires within the lines of the business part of the city underground. It is desired to increase the capital stock from \$300,000 to \$400.000.

#### MANUFACTURING, ETC.

Birmingham, Ala—The Alabama Supply Company of this city wants the addresses of manufacturers of electrical supplies.

Ft. Wayne, Ind.—The Fort Wayne Electric Company will manufacture on a large scale Mr. Wood's new focusing arc lamp, a recent invention which possesses several advantages over the old lamp.

#### POWER AND TRANSMISSION PLANTS.

Athena, Ore.—A company of business men of this place have purchased a site up the Walla Walla River, seven miles above here, with the intention of developing and placing thereon an extensive electric plant. This power will be conveyed to Athena across the country by means of the usual overhead wires, and with it the town will be lighted and motive power applied for various mills.

#### AUTOMOBILES.

Akron, O.—An automobile patrol wagon has been built by this city and is said to be the first of its kind manufactured. The wagon weighs 5,500 pounds and is equipped with two four hp. motors. Its maximum speed is said to be 2) miles an hour. The wagon cost \$2 300. It is asserted that in a test the new vehicle ran through deep mud and up and down hill easily.

Boston, Mass.—The Colonial Automobile Company has recently turned out a novelty in the automobile line, in the form of a steam vehicle having three rear wheels, the center one being the driving wheel. Mr. Kent the inventor, believes that several difficulties are overcome by this arrangement and important advantages secured.

Bridgeport, Conn.—Ground has been purchased for the erection of a factory for the manufacture of automobiles and locomobiles. Upward of 3,000 hands will be employed. The name of the concern is the Locomobile Company of America. A. L. Barber, of New York, is president, and Dr. I. Dever Warner, of this city, is one of the backers. It is reported that Grover Cleveland and E. C. Benedict are also interested.

Chicago, Ill.—The Woods Motor Vehicle Company has recently completed two electric mail wagons which are to be sent to Washington. The postal authorities will test the new vehicles and report on the advisability of their use in the large cities.

New York.—President Clausen, of the Park Board, has granted permits for running automobiles in Central Park to Dr. William T. Jenkins. of the Health Board, and A. C. Miles—Last week Mr. C. A. Seaman purchased an electric automobile at the Bicycle and Automobile Show, which was shipped to Florida. The price is reported to be \$1.500.—The Automobile Company of America has recently secured the shops at Marion, N. J., which will be equipped with modern machinery for the production of automobiles.

Providence R. I.—An omnibus was designed recently.

machinery for the production of automobiles.

Providence, R. I.—An omnibus was designed recently by Frank Mossberg and his associates in the United States Automobile Company, and the intention is to have several of these vehicles running in Roger Williams Park and at Narragansett Pier next summer. The factory in Attleboro is too small for building motor vehicles and the company is looking for a building in this city or Pawtucket large enough for turning out at least two vehicles a week.

West Hartford, Conn.—Last week several residents of this place attended the Bicycle and Automobile Show at New York, with a view to buying an automobile to compete with the trolley line from Foot's Corner to West Hartford.

## MINES, ETC.

San Francisco, Cal.—The new mining camp of Cape Nome, under the Arctic Circle, will start in the spring with electrical mining machinery.



## THE TELEPHONE WORLD.

A hearing of considerable interest, says the Washington was given recently by the Commissioners to the Senate bill, 1235, "To permit the Washington Telegraph & Telephone Company to install, maintain and operate a telephone and telegraph plant and exchange in the District of Columbia." In the interests of the proposed company there were present: Hon. H. W. Rusk, George R. Webb, Samuel Ross, Sidney H. Brown and H. W. Webb, Mr. George W. Webb addressed the Commissioners principally in regard to the resources and efficiency of the corporations interested in the establishment of the independent telephone system, which is being introduced in a number of cities, and which the proposed company is anxious to establish in Washington, He said that Mr. Latta, at one time general agent of the Pennsylvania Railroad, is the president of the combination controlling the interests of the independent telephone system in various cities, and that the people who were formerly interested in the street railways of Philadelphia, Messrs, El-kins and Widener, have taken hold of the project. Mr. Webb stated that the United Telephone & Telegraph Company, which owns the Pittsburg plant, as well as the Baltimore and Wilmington plants, will own the stock of the local plant. He said there was a separate organization in each town, and it was the intention to join the New York and Philadelphia lines and come from Wilmington and Baltimore, and from Washington to Pittsburg. He stated also that independent systems were being established in Cleveland, St. Louis and Chicago, and various other towns in the West, with all of which the main company would eventually combine and establish a complete long-distance service. The rates, he said, would be \$48 a year for a business telephone and \$36 for a residence telephone, these being the standard rates adopted in each city. The Commissioners have the matter under advisement, and their views on the subject will be embodied in the report which they will make on the bill to Congres

The independent telephone companies, says the N. Y. "Commercial." are poshing ahead in New Jersey, and negotiations are being conducted for the formation of new companies and the purchase of old concerns. A few days ago the Atlantic Coast Telephone Company was incorporated at Atlantic City, with a capital of \$100,000, under the laws of New Jersey, by Louis Knehmle, Charles C. Fortner, R. B. Hazlett and James B. Reilly. The existing company there charges subscribers from \$48 to \$80, while the new concern will charge from \$24 to \$36. Negotiations have also been concluded by which the Montclair & Bloomfield Telephone Company has been sold to the Telephone, Telegraph & Cable Company of America. A large sum of money will be spent in developing the service in the territory.

At the annual meeting on the 17th inst. of the stockholders of the People's Telephone Company of Biloxi, Miss., the following board of directors was elected for the ensuing year; John Walker, W. K. M. Dukate, H. E. Latimer, L. Lopez, Jr., D. A. Nash, J. C. Clower, R. J. Lowery, J. B. Chim and Byrd Enochs. The following officers were re-elected: John Walker, president; W. K. M. Dukate, vice-president; John Canaway, secretary and treasurer; E. L. Doyle, general manager. There was an annual dividend of 10 per cent, declared, payable to the stockholders January 20. This is a splendid showing for the company, and the constant demand for telephones indicates a decided commercial development in that town, which has accorded the company such a liberal patronage.

The Waynesboro Telephone & Telegraph Company are soon to erect a telephone exchange at Louisville, Ga. They are also building a line from Waynesboro which will connect with the Southern Bell Telephone Company, and will soon have first-class telephone communication with the outside world. They have already been granted a franchise by the city authorities, and their representative said recently that they expected to have it in operation in the next thirty days.

The second quarterly meeting of the Interstate Telephone Association was held at Joplin, Mo., on the 16th inst. The association embraces about 100 different towns in Southwest Missouri and Southeast Kansas, and embraces twenty-five independent telephone systems. The association adopted the standard construction system and established a basis for long distance toll charges, 25 cents being the charge for fifty miles, and 10 cents for each additional twenty-five miles. The association's plans will greatly benefit the service of the independent telephone companies of the Southwest. The next meeting of the association will be held at Fort Scott, Kan., on April 10.

The Independent Telephone Company has its line in working order from Montgomery, Minn., south. The Home Telephone Company, operating its line between Montgomery and LeSueur Center, the county seat of LeSueur county, has arranged to make connections at Montgomery with the In-

dependent Company so that direct communication can be had to LeSueur Center from any point reached by the latter company for the single charge of 25 cents.

The Ohio Valley Telephone Company has announced a decided advance in rates, to take place February 1, in New Albany. O. For several years on account of the sharp competition of the Home Telephone Company, a corporation controlled and owned by New Albany people, the rates have been reasonable: the price to private residences being but \$1 a month for the Ohio Valley Telephone Company and a slightly increased rate on the part of the other company. These low rates greatly increased the patronage and both companies now have in operation in New Albany about 1,200 telephones. The advance announced will probably cause a number of subscribers to the service to withdraw their patronage. Even at the low rates charged the enterprises must have been profitable, as the Home Telephone Company a few days ago declared a semi-annual dividend of 3 per cent. The earnings in New Albany of the opposition company have not been announced.

E. L. Grauel, representing the Northern New York Telephone & Telegraph Company was in Ogdensburg, N. Y., recently endeavoring to obtain a franchise to operate a system in that city. The Northern New York Telephone & Telegraph Company comprises a district of which Carthage, N. Y., is the southern boundary point and the St Lawrence river the northern. The line will extend east as far as Newton Falls and west to Watertown. The company already has an exchange in Carthage, another ready for operation in Watertown, and desire to place an exchange in Ogdensburg. The company will make competition with the new line put up in Franklin county and with a local line under course of construction between Utica and Carthage, thus giving connections with every town in that section of the State, as well as first classlong distance service.

The East Tennessee Telephone Company has just completed at a cost of several thousand dollars a new copper circuit between Dayton and Chattanooga, Tenn. It will be used exclusively for through work, and will greatly facilitate the handling of the rapidly growing business between those two points. It also completes a through metallic circuit from Dayton to Nashville, Cincinnati, Chicago and all points north and east.

An action has been commenced by the Stromberg-Carlson Telephone Company against the Mississippi Valley Telephone Company and J. C. Hubinger, to enforce the payment of \$8,003.25, alleged to be due on notes. It is claimed that two notes were given by the defendant, one for \$5,000 and one for \$3,000, the latter having gone to protest in November last. It is understood the paper was given as collateral in payment for switchboards and other apparatus.

A war has been inaugurated at Russellville. Ky., against the East Tennessee Telephone Company. The company notified their patrons that they had raised the rates 50 cents per month, and immediately every merchant, but four, in the city, and numerous private residences, ordered their phones out. It is said to be war to the knife, and the result will be watched with interest.

A new hundred-drop switchboard is to be placed in the local exchange of the Gainsboro (Tenn.) Telephone Company within the next thirty days. The old board would not accommodate the increased patronage of the exchange. An operator will be kept at the exchange all night. This company is rapidly increasing its nuleage, both by extensions and purchase of other lines.

P. D. Tebault, of the Maryland Telephone Company, at Hagerstown, Md., and S. L. Hoover, of the Winchester, Telephone Company, arranged recently at Sheperdstown, W. Va., to have the Maryland Company's franchise at Sheperdstown, together with its lines and materials, turned over to the Winchester Company. The latter company will extend its lines to Sheperdstown at once.

The Salt Lake City "News" says that a telephone line to the Deep Creek mining district, to be put up in the near future, is being contemplated by the Rocky Mountain Bell Telephone Company. This line is one of vital importance to those interested in the Deep Creek country and at last the telephone company has yielded to their importunings. The line, will be about 125 miles long and will project from Stockton into the very heart of the Deep Creek country.

Directors of the Eastern Shore Telephone Company met at the Hotel Avon in Easton, Md., on the 25th inst., and absorbed the Union Telephone Company of Talbot County and the telephone lines of Cecil County. This was the last step in the amalgamation of all the telephone lines on the peninsula of Delaware, Maryland and Virginia by the Diamond State Telephone Company. Men are at work connecting Seaford. Del., with Cambridge and Easton, Md., and by the middle of next week will have the entire peninsula system in working order.

The citizens of Jefferson City, Mo., are making an effort to secure cheaper telephone rates. They pay now \$2 for residences and \$3 for business houses per month to the Missouri & Kansas Telephone Company. They are trying to organize an independent company which will furnish telephones at \$1 per month to residences and \$2 for business houses. A committee has been appointed to confer with the Kansas City Mutual Telephone Company regarding putting in a system there at the above rates.

The Moultrie County (III.) Telephone Company has been reorganized with these officers: President, Silas D. Stocks, Sullivan: treasurer, L. D. Hostetler, Lovington; secretary, Marion Watson, Arthur; directors: George B. Spilter, Mount Zion, Macon County, and C. Lane. Sullivan. The line connects Mount Zion, Arthur. Sullivan and Lovington with the Macon County Telephone Company exchange and Decatur, III. The capital stock of the Moultrie County company is \$10,000.

The Telephone, Telegraph & Cable Company of America has filed an application for permission to construct subways through the streets of Yonkers, N. Y. The common council and mayor have approved the \$15,000 bond filed by the company to guarantee that work will be begun within a certain time after the permit is granted.

After a long and bitter fight the Colorado Telephone Company was given a franchise in Ouray, Col., over the Ouray Company, organized by J. F. Stodghill of Salida, the council standing 6 to 2. Rates will be the same as in cities of the third class having 125 telephones or less.

At the annual meeting of the Blue Earth Valley Telephone Company of Winnebago City, Minn., the following officers were elected for the ensuing year: W. Z. Haight, president; J. H. Sherin, vice-president: W. H. Hodgman, secretary and manager; David Secor, treasurer.

The Clarksville Telephone Company of Clarksville, N. Y., has elected the following directors: Cornelius Slingerland, M. W. Conger, L. S. Schell, J. M. Wright, C. L. Shea, A. Joslyn, M. T. Barber, J. W. Whitbeck, A. H. Crounse.

The Jefferson-Warren Telephone Company of Warren, O., has decided to increase its capital stock from \$40,000 to \$100,000. The lines of the company will be extended to Mercer, O., and other cities.

The independent long distance telephone line is being completed to Abilene, Kan. The new system at that place will then have a connection with Salina and also with all the towns in southeast Dickinson county, Kan.

Work on the new exchange of the Michigan Telephone Company at Niles, Mich., has been begun.

#### TELEPHONE INCORPORATIONS.

The Hawkeye Telephone Company, Iowa Falls, Iowa- to operate a system in I wa Falls. Capital stock, \$40,000.

The Kansas Telephone Company, Fort Scott, Kan. Capital stock, \$200,000. Directors: Grant Hornaday, W. P. Patterson and C. E. Cory.

The Tipton Telephone Company Tipton, Mo. Capital stock, \$1,400. Incorporators: J. M. Boyd, J. W. Marsh, P. J. Weber and others.

The Automatic Interconnecting Telephone Company, San Francisco, Cal.—to deal in telephones and to operate a system. Capital stock, \$100,000. Incorporators: A. K. Andriano, W. T. Hess, J. Finck, F. D. Bates, L. Harris, all of San Francisco

The Excelsior Telephone, Telegraph & Subways Company (incorporated at Trenton, N. J.)—to do a general telephone and telegraph business and to erect poles and wires and construct underground conduits in New York City and elsewhere. Capital stock. \$5,000,000. Incorporators: Richard White, New York; John Scott and C. N. King, Jersey City.

The Emergency Telephone Call Company of America, Albany, N. Y.—to operate a system of telephone and messenger calls, to publish a directory of subscribers and establish necessary agencies. The company will begin operation in New York City, but will hereafter extend its business to other cities throughout the United States. Capital stock, \$50,000. Directors: Albert Randolph, William A. Butler and Frank A. Peteler, of New York City.



### ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electricity from a variety of source The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gcn., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mig., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

# STOCKS.

PASSE	NG	ER R	AILW	AYS.			PASSE	NG	ER R	AILW	AYS.		
		Capital	Stock.	Rate and Date of					Capital	Stock.			
NAME.	Par	Authorz'd	Issued.	Last Div.	Bid.	Asked.	NAME.	Par	Authorz'd	Issued.	Bate and Date of Last Div.	Bid.	Asked
Albany. N Y. Jan 29 United Traction (O) nsolidation of the Albany and Troy Ofty Railway.)	100	2,000,000	81,750,000	1 % % Q., Nov. '98	. 125	129	Hartford Conn Jan 29: Hartford Street Ry. Co Hartford & West Hartford RB Holyoke MassJan 29	100	\$4,000,000 1,000,000	\$200,000 247,000	8 % S., Oct., '98.	145	:
Allentown Pa Jan 29							Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June, '98.	200	2073/4
Allentown & Lehigh Val. Trac Oo		4,000,000	1,500,000			15	Hoboken, N. J.—Jan 29 North Hudson Co. (N. J.) Ry. Co	25	1,250,000	1 000 000	8 %, 1892	150	
Bridgeport, Conn—Jan 29 Bridgeport Traction Co.	100	2,000,000		1 % Aug., '98.	105		Indianapolis, Ind-Jan 29. **Citizens' Passenger Ry		5,000,000			28	30
Baltimore, MdJan 29 a United Railways & Elec. Cocom.	50	24,000,000	18 000 000		161/	17	Lancaster, PaJan 29	100	10 000 000				
Boston, Mass.—Jan 29 New England Street Ry				1 % Q., Jan.15, '97			Pennsylvania Traction Co Lancaster & Col. Electric Ry West End Street Railway		10,000,000	9,900,000		:	=
North Shore Traction Cocom North Shore Traction Copfd. b West End Street Ry. Cocom West End Street Ry. Co % pfd	100 100 50 50	4,000,000 2,000,000 10,000,000 6,400,000	4,000,000 2,000,000 9,085,000 6,400,000	6 % S., A. & O. 3½ % S., Oct., '98. 4 % S., Jan. 2, '99.	15 85 98 112	16 87 93% 114	Louisville, Ky.—Jan 29: Louisville Bycom. Louisville Rypfd	100 100		8,500,000 2,500,000	1½ %., April '98. 2½ % S., Oct. 1, '98	68 110	70 111
Brooklyn N. Y Jan 29 Brooklyn City Ry	100	2 000 000	1,928,400	21/4 % Aug. 98,	237	239	Minneapolis, Minn.—Jan 29 Twin City Rapid Transitcom. Twin City Rapid Transit	100	17,000,000 8,000,000	15,010.000 1,712,200	13/4 %, Oct., '98.	€38/8 136	631/6
Brooklyn Rap. Transis vo., tr certf cBrooklyn Heights Railroad *dBrooklyn City RRguar	100	20,000,000	20,000,000 200,000 12,000,000	3½ % Q., Jan., '99.	71% 107 288		Montreal, Canada.—Jan 29: Montreal Street Ry. Co Toronto Street Ry. Co	50 100		4,000,000 6,000,000	8 % S., M. & N. 13/4 % S., J. & J.	287 1027/8	2 8
eBrooklyn, Queens Co. & Sub. RR. Coney Island & Brooklyn RR. Kings County Elevated. Kings County Traction Co.	100	2,000,000 4,750,000 4,500,000	1,884,200 4,750,000 4,500,000	2 % % Nov., '98, 1 % July 26, '97	3 35		Memphis Tenn Jan 29; Memphis Street Railway Co	100	500,000	500,000	***************************************	25	-
Nassau Electric Railroadpfd. /Atjantic Avenue Railroad gBrooklyn, B. & W. E. Railroad	50	2,000,000	2,000,000	************	76	77	New Haven & Westville Rg New Haven Street Railway Co	25 100	1,250,000	1,000,000	3 % S., Sept. '98. 2½ % A., July '96.	46	-
Buffalo N. Y.—Jan 29 : Buffalo & Niagara Falls Elec. Ry *Buffalo Railway Co	100 100		1,250,000 5,870,500	1 % Q. Dec., '98.	74 101	75 103	Winchester Avenue RR	100 25		800,000 600,000		47	=
Columbus O.—Jan 29 Columbus Street Railroad Columbus Street Railroad, pfd	100 100		8,000,000 1,500,000	1 % Q., Feb., '99.	20	22	New Orleans & Carrollton RR New Orleans Traction Oo new com.		1,200,000	240,000 1,200,000		148% 29¼ 01	29%
Charleston, S. C.—Jan 29 Charleston City Ry. Co Enterprise City RR. Co	50 25	100,000 1,000,000		8 % S.		::	aCrescent City RR. guar. bNew Or. City & Lake RR. guar. Orleans Railroad St. Charles Street Railway		2,000,000 2,000,000 500,000	2,000,000 2,000,000 185,000	8 % S., Jan., '99. 4 % S., Jan., '99. 1½ %., June, '94. 1¼ %. Oct., '98.	20%	52
Chicago, Ill.—Jan 29 Chicago City Ry. Co		12,000,000	12,000,000	8 % Q., Dec. 81, '98	275	280	New York—Jan 29.		2,000,000			.561/9	280
Lake Street Elevated RR. Metropolitan West Side Elev. Ry Met. West Side El., pfd North Chicago Street RR. North Chicago City RR. South Chicago City Railway West Chicago St. RR. Co (Chicago West Div. Ry.	100 100 100 100 100 100	10,000,000 15,000,000 15,000,000 10,000,000 500,000 2,000,000 20,000,000	10,000,000 15,600,000 2,500,000 6,600,000 249,900 1,603,200	3 % Q., Jan., 99.	17 <sup>1</sup> / <sub>4</sub> 24 76 286 110 <sup>1</sup> / <sub>4</sub>	18 25 78 237 	Dry Dock, E. Brdwy & Bastiery RR. dMetropolitan Street Ry. Co. eBleecker St. & Fulton Fy.Ry. guar fBroadway & Seventh Ave guar, gCen. Park, N. & E. Rivers RR. guar AEighth Avenue RR.  142d St. & Grand St. Ferry RR. guar	100 100 100 100 100 100 100	750,000	748,000	2½, % Q., Oct., '98, 1½, % Q., Nov., 98, 1½, % Q., Jan., '99, ½, % A., July, '98, 2½, % Q., 2½, % Q.	168 125 168 35 280 195 880 395 195	174 150 168 <sup>1</sup> / <sub>4</sub> 40 240 4(0 410
tChicago Passenger Ryguar. Cincinnati, Ohio.—Jan 29: Cincinnati Inc. Plane Rycom. Cincinnati Inc. Plane Rypfd.						85	kSixth Avenue RR. guar Twenty-third St. R. R. Co. guar Second Avenue RR. Third Avenue RR. m42d St. Manhatv'le & St. Nich. Av *Union (Huckl-berry) Ry.	100 100 100 100 100	2,000,000 600,000 2,500,000 12,000,000 2,500,000	2,000,000 600,000 1,862,000 10,000,000 2,500,000	4½ % Q. 2% Q., Jan,, '99. 81 75 p. sh. Feb. 99.	209 898 200 1091/4 75	82
Cincinnati, Newport & Cov. St. Ry. iCincinnati Street Ry. Co	100 50 50	4,000,000 18,000,000 2,500,000	8,500,000 14,000,000 2,200,000	% % Feb., '99. 2% % Feb., '98. 114 % Q., Jan., '98. 116 % Q., Jan., '98.	83 120¾	89 121	Newark N JJan 29; Consolidated Traction Co. of N. J North Jersey Street Pollman	100	2,000,000 15,000,000 6,000,000		***************************************	190 61 80	613/4 81
Akron, Bed. & Clev. Elec. By Oleveland City Ry Cleveland Electric Ry	100 100 100	1,000,000 8,000,000 12,000,000	1,000,000 7,600,000 12,000,000	34 % Jan., '98 3-5 % Jan. '99, 34 % Q., Oct., '98,	48 99% 90	50 100 91	Pittsburg, Pa.—Jan 29:	100	504,000	504,000	134 % A.	21/2	27%
Detroit, Mich.—Jan 29 Detroit Citizens' Street Ry Ft. Wayne & Belle Isle Ry. Rapid Railway Oo. Detroit Electric Railway.	100	2,000,000	1,250,000 1,200,000 250,000	***************************************	100½ 175 90		Consolidated Traction Coopfd. pCentral Traction Copfd. pCentral Traction Co qCitizens' Traction Co rDuquesne Traction Co sPittshurg Traction Co	50 50 50 50 50	15,000,000 15,000,000 1,500,000 8,000,000 8,000,000	15,000,000 2 15,000,000 8   900,000   18,000,000 6	2%, Jan., '95, 3%, Nov. '98, 1, % Nov. 7, '98, 1, % A. 1, 3, %. Nov. 7, '98,	28 61 69 <sup>1</sup> / <sub>69</sub>	55 8½ 62 70 70
wyandone & Detroit River Ry	100	1,000,000 250,000		************	100	iio	Pgh Allegheny & Man Tree G	25	2,500,000 1,400,000	1,900,000	3/ %, Nov. 7, '98. 21/2 %, July, '98.	28	281/4
Dayton O.—Jan 29: Olty Railway Ooeom. Olty Railway Oopfd. People's Street Railway	100 100	600,000	1,470,600 600,000 1,100,000	1% % Q.	126½ 160 114	115	Pitsourg & Birmingham Trac. Ry Pitsburg & West End Ry. United Traction Cocom United Traction Copref.	50 25 50 50	8,000,000 8,000,000 1,500,000 17,000,000 8,000,000	1,500,000 1,000 000	3/ A. Nov. 7, '98. 3/ %, Nov. 7, '98. 2/ %, July, '98. 2/ %, Aug., '95. 1/ %, Oct. '98. 5/ A., June 30, 98. J. & J. J. & J.	40 12 46	42¼ 16 47

\*Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consol dated Railway & Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by the secompanies, and also the Central Railway Co of Baltimore. The pref stock of UR & Ecc Co has been issued in the form of mome bonds, because to Beston E evated Railway Company.

a Cowned by Brooklyn Rapid Transit Company.

a Leased to Beston E evated Railway Company.

a Leased to Beston E evated Railway Company.

a Leased to Beston Heights Railroad Co., which guarantees 10% on capital stock.

a Stock owned by Kings County Traction Company; road persued by Brooklyn Rapid Transit Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave RR and leased to Nassau system.

h \$30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.;

c Touris by lesse Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Company.

f St. per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company.

k Majority of stock owned by Chicago West Division Railway Company; 505,000 of stock owned by West Chicago Street Railroad Company.

k Majority of stock owned by Chicago West Division Railway Company; 500 of \$1,000,000 stock guaranted by West Chicago Street Railroad Company.

Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds

\*Unlisted. † Full paid. | Outstanding. † Ex-div.
a Leased to New Orleans Traction Company as 6 % on stock.
b Leased to New Orleans Traction Company as 8 % on stock.
b Leased to New Orleans Traction Company as 8 % on stock.
c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
e Leased to 23d Street Ry for 99 years; lease assigned to Met-opolitan Street Ry.
f Leased to Houston, West Street & Payonia Ferry—now Metropolitan Street Ry.
f Leased to Metropolitan Street Ry. at 8 % on stock until Oct 1. 1897; thereaft r 9 %.
h Leased to Metropolitan Street Ry. for 99 years from Jani 1, 1895, at \$215,000 per annum.
i Leased to Metropolitan Street Railway for 18 % on etc. k
j Leased to Metropolitan Street Railway for 18 % on capital stock.
m Controlled by Third Avenue Railroad by nurchase.
n Dividends of 1% % yearly guaranteed by Consolidated Traction Company,
o Controls by lease the Alleg'ny, Cent., Ottz-ns' Duquesne. Fort Pitt & Pita'n Traction,
p Leased to Consolidated Traction Company for 8 % on apital stock.

Eleased to Consolidated Traction Company for 8 % on apital stock.



#### PASSENGER RAILWAYS.

#### TELEPHONE AND TELEGRAPH CJS.

	_	Capital		Bare and						Capital		Bate and Date of		
NAME.	Par	Authors'd	lesued.	Last	Div.	Esd.	Asked.	NAME.	Par	Authors'd	Issued.	Last Div.	Bid.	Ass
aw Badiord Mass Jan 29 nion Street Railway Oo. Jrunampton, Mass-Jan 29	100			2 %, Feb.		160	165	Boston, Mass.—Jan 29. American Bell Telephone Co Erle Telegraph & Telephone Co New England Telephone Co	100 100	50,000,000 10,894,600	28,650,000 10,804,600	4% % Q., Jan '99. 1 % Q., Feb. 20, '99 \$1.50 p. sh, Feb '99	534 9.04 185	331 104 186
orthampton Street Rv., maha, Neb Jan 29 :	100	800,000	220,000	4 % A., Ju	ine wa,	170	178	New York.—Jan 29 American Telegraph & Cable Co	100	14,000,000	14 000 000	12 8 0	96	99
maha Street Rv	100	5,000,000	<b>5,000,00</b> 0	8 % A. an	d N.	55	65	*Central & South Am. Teleg. Co *Commercial Cable Co	100	6,500,000 10,000,000	6,500,000	1 × × 0.	114	1.7
aterson, N. J.—Jan 29 Merson Rv. Co	100	1,250,000	1,250,000	*********	•••••	54		Franklin Teleg. Co21 % guar. Erie Telegraph & Telephone Co *Gold & Stock Telg. Coguar. 6 %.	100 100	1,000,000 5,000,000	4,800,000	1% % 8. 1 % Q., Feb., '99. 1% % Q. 1% % Q.	112	118
POVIDENCE, R. I.—Jan 29 nited Traction & Electric Co	100	8,000,000	8,000,000	% %, Oct	'96	108	108%	*International Ocean Tel Co.guar6% Mexican Telephone Co	100 100 100	8,000,000	• • • • • • • • • • • • • • • • • • • •	ixxx	115	1.9 119 119
niladel phiaJan 29	50	2 000 000	1 550 000	0.44 Dec 3	næ.	28	24	*New York & New Jersey Tel. Co *Pacific & Atlantic Telegguar. 4 %	100 25	5,000,000 2,000,000	8,728,000	2 % % Q., Jan., '99.		18
sirmount Park Traus. Co\$53 pd. estonville, Man. & Fairmount est'nvi'e, Man. & Fairm't6 % pfd.	50	1,966,100 583,900	1,770,000  1,966,100  588,900	2 %, Dec. 2 % %, Jul 8 % S—Ju	y 15, '98, ly, '98,	47 76	48 76	*Postal Telegraph Cable Co* *Sout'n & Atlantic Telg. Oo.guar.5 % †Commercial Union Telegraph Co	100 25 25	15,000,000 950,000 <b>50</b> 0,000	15,000,000 559,525	1 % Q. 2% % 8. 8 % 8., Jan., '99.	114	ıic
aFairmount Pk. & Had. Pass. Ry. nion Traction Co \$12⅓ pd	50 50	800,000 80,000,000	29,980,450	8 % Feb.	1, '98.	75 31/4	76 311/4	Western Union Telegraph Co †Div. guar. by Postal Teleg. Co.			97,870,000	1% %, Q, Jan. '99.	8634	€ 80
dOitizens' Passenger Ry Frankford & Southwark Pas. R	50 50 50	500,000	T192,500	\$8 share 6	ચ.	845 45	451	Miscellaneous Jan 29:	_	400.000		1 2 0		
Lehigh Avenue Ry. Co	50 25	1,000,000	1,000,000	A. & O.	•••••	48 90	90%	American Dist. Teleg. (Phila.) Bell Teleph. Co. (of Canada.) Chesapeake & Potomac Telep. Co	25 100 100	400,000 8,960,000	8,561,000		21 188 t 8	6
dSecond & Third Streets Ry  People's Traction Co	50 50 50	1,060,000 10,000,000 1,500,000	<b>†6,000,000</b>	89 share A 8 %, A., A	lprii, '98.	8: U 1:4	 145	Chicago Telephone Co	100 100	750,000	750,000		200 148	210 150
gGermantown Passenger Ry gGreen & Coates Passenger Ry. hPeople's Passenger Rycom.	50 25	500,000	150,000	85.25 share 8 % Jan.,	1898.	151	152	Empire & Bay States Telegraph Oo. Hudson River Telephone Co *Northwestern Telegraph Coguar	100 50	2,000.000	2,000,000 2,500,000		76 114	118
hPeople's Passenger Rypfd. Philadelphia Traction Co	 50	750,000 30,000,000	[277,402] [20,000,000]	82 p. sb., 0	Oct. 98.	 96	 96⅓	Providence (R. I.) Teleph. Co Southern New Eng. Teleph. Co	50 100	2,500,000 8,000,000		-74.74	90 90	
Continental Pass. Ryguar	50 50 50	1,000,000	580,000	6 % A—Mi 86 share—	July, '98.	158	157	ELECTRIC LIGHT				OAL MFQ	.0	<del></del> -
†Empire Passenger Ry. Co Philadelphia City Pass. Ry Philadelphia & Gray's Fy. RR	50 50	1,000,000	298,650	\$7.50 share \$8,50 share	e July '98' e July '98	100	208	Boston, MassJan 29:						ī
Ridge Avenue Passenger Ry Puliadelphia & Darby Ry.guar.	50 50	750,000	[420,000 [200,000]	812 share, 82 share J	July '98. ulv. '98.	8.8%	809	Fort Wayne Electric trust receipts Ft. Wayne Elec Oo. T. Sec. Series A.	25	40.000.000		0.00	115 35	12
il7th & 19th Sts. Pass. Ry. guar iThirteenth & 15th Sts. Pass. Ry. iUnion Passenger Ry. Co	50 50 50	1,000,000 1,500,000	1250,000 1835,000	1% % S., J 811 sh. A., 89.50 shre,	uly, '98. July, '98.	300 249	240	tGeneral Electric Co. [old] com.   General Electric Co. [new] "   TH. Elec. CoT. Secur., Series D.	100			2 % Q., Aug., 1898. 1% % Q., May '99.	117	12
iWest Philadelphia Pass. Rv	50	750,000	750,000	\$10 share,	July '98	25J	•••	Westinghouse Elec. & Mfg.Co.com. Westinghouse El. & Mfg. Oo. pfd.	50 50	4,000,000	146,700 8,996,058	1% % Q., Jan., '99.	42× 62	
Cochester, N. Y Jan 29 Chester Railway Co	100	5,000,000	5,000,000	,,,,,,,,,,,,		15	16	Westinghouse El. & Mfg. Oo. assent. New YorkJan 29:	50	11,000,000	8,195,125	•••••		-
eading, PaJan 29		1 000 000		~	7 A. T	24	04	Edison Elec. Ill'g Co., New York *Edison Elec. Ill'g Co., Brooklyn	100 100	9,188,000 4,000,000	7,988,000 2,000,000	1½ % Oct., 198.	119	120
City Passenger RyIEast Reading Electric Ry	50 50	1,000,000 850,000 1,000,000		Semi-an.,. Jan., 198. Jan., 198.	Jan. & Jy	136 70	26	Edison Ore Milling Cocom,	100			••••	8 82	12
t. Louis MoJan 29		1,000,000	11,000,000	Jan., 20.				†General Electric Oo. [old]com.   General Electric Oo. [new] "   Interior Conduit & Insulation Oo	100	18,276,000	18.276,000	2 % Q., Aug., 1898. 1½ % Q., May '99.	123	12
ourth Street & Arsenai By efferson Avenue By. Co	50	800,000 400,000	150,000 400,000	2 % Dec.,	1888.	-:	••	Kings Co, El. L. & P. Co	100 100	1,000,000 2,500,000	2,500,000	A. & O.	110	13
Indell Ryational Railway CoCass Avenue & Fair Grounds	100	2,500,000 2,500,000 2,500,000	2,400,000	1 % % Jan.	. '99.	:-	••	Pittsburg, Pa —Jan 29 Allegheny County Light Co	100	500,000	500,000	J. & J.	168	,,
Cass Avende & Fan Grounds St. Louis RR	100 100	2,000,000 2,000,000	1,500,000 2,000,000	4 %, Oct., 2% %, Jar 1% % Jan. 50c., Dec.,	'98. 1., '99.	••	::	East End Electric Light Co Philadelphia, PaJan 29	50	800,000	800,000	Q		•
issouri RR	50 50	2,400,000 1,000,000	2,300,000 300,000	1½ % Jan. 50c., Dec.,	, '99. '89.	::	••	Edison Electric Light Oo* *Electric Storage Battery Cocom.	100 100	2.000,000 8,500,000		*****	144 120	14
outhern Electric Rycom. outhern Electric Ry6 % pref.	50 100 100	500,000 1,000,000	1 000,000	8 %. Jan	'99.	76	78	*Electric Storage Battery Copfd. Northern Elec. Light & Power Co	100	5,000,000 550,000	550,000	*****	116	12
. Louis & Suburban Ry nion Depot RR	100	4,000,000	2,500,000 4,000,000	8 % A., Ju	ıly, '95.	••	••	Southern Elec. Light & Power Co Miscellaneous Jan 29:	10	187,500	187,500	••••	<b>3</b> U	•
an Francisco, Cal.—Jan. difornia St. Cable RR	100			50c.month		116		Bridgeport (Conn.) Elec. Lt. Co Missouri-Edison (St. Louis)com,	25	500,000	••••	******	47 25	14
eary Street Park & Ocean RR arket Street Ry		18,750,000	18,750,000	82.50 share Q., 60c. pe	r share.	62½	68 16	Eddy Electric Mfg. Co	25 100	850,000		••••	18 % 128	18
residio & Ferries RR cpanton, Pa —Jan 29	100	1,000,000	550,000	**********	••••	••	10	Hartford (Conn.) Lt. & Power Co New Haven (Conn.) Elec. Lt. Cc	25 100	175,000 100,000		••••	6 195	١.
Beranton & Uarbondale Trac. Co	50 100	6,000,000 500,000	2,500,000 500,000			29 16%	80	Narragansett (Prov., R.I.) Elec. Co. Rhode Island Elec. Protec. Co Royal Elec. Co. (Montreal)	50 100	1,200,000		2 % Q., Oct., '98.	95 118-√ 198	10
Scranton & Pittston Traction Co., pringfield Ill.—Jan 29	100	1,050,000	1,050,000	******	•••••	••	••	Toronto (Canada) Elec. Light Co Thomson-Houston Welding Co	100	1,085,000	1,085,000	1% % Q 3 % 8, Dec. 1, 26.	180	13
pringfield Consolidated By	100	750,000	750,000	***********	••••	••••	••	Woonsocket (R. I.) Electric Co †On Aug. 17 last by a majority vot	eof	the stock	nolders th	 ne capital stock wa	105 s red	10
pringfield O.—Jan 29 pringfield Street By	100	1,000,000	1,000,000				11	to \$20,827,200, of which \$18,276,000 is c   Recently sequired the Edison III	omn umir	on and \$2	ום 200 וסו	eferred.	1 Ex	: d1
pringfield, Mass.—Jan 29: cringfield Street Ry	100	1,200,000	1 166 500	a • ⁄ •		207	212	pany, the Municipal Electric Light  ALLIE		INDUS	STRIE			
oronto CanadaJan 29:	اسا	1,200,000	1,166,700	о <b>Д</b> , Д.,				Boston MassJan 29;	1			<del></del>		Г
oronto Street Ryoutreal street Banway Co	100	6,000,000 4,000,000	6,000,000 4,000,000		ş	1027/s 811	1(3¼ 312	Delaware Gas Light Cocom Delaware Gas Light Copref.	50 50	500,000	500,000 200,000	J. & J. J. & J.	72× 98	
Vashington, D. CJan 29:	50	500,000	500 000					American Electric Heating Co Street Ry. & Illu'g Propertiespfd		10,000,000	1,248,700	12 p. sh. Jan. 26, '99	::	=
eit Ry. Co apital Traction Co glumbia Ry. Co		\$12,000,000 \$00,000	400.000	6% Å.	, Oct. 97.	92	92¹ g	United Electric Securities Copfd.  New YOPKJan 29:	100		1,000,000	\$8.50 p.sh. Nov 98.		100
ckington & Soldiers' Home Ry eorgetown & Tenallytown Ry	50 50	707,000 200,000	652,000 200,000		••••	85 15	40 16	Consolidated Electric Storage Co Safety Car Heating & Lighting Co	امتد			••••	10	20
etropolitan RR. CoVorcester, Mass Jan 29	50	1,000,000	458,900	2% <b>% Q.</b>		••	••	Worthington Pump Cocom. Worthington Pump Copfd	100 100 100	5,500,000 2,000,000	5,500,000 2,000,000			155
Worcester Traction Co % pfd.	100 100		8,000,000 2,000,000	3 % S., Fo	b 198.	80 1.41⁄6	31 1051	Philadelphia PaJan 28:			2,000,000			
Vorcester & Suburban Street Ry VILKESDAPPE, PaJan 29	100	550,000	542,500	4% %, 189	7.	1 ~	85	Electro Pneumatic Trans. Co United Gas Improvement Coscrip. Weisbach Commercial Cocom.		1,500,000	*****		1	1 16
ilkesbarre & Wyoming Val. Trac	100	5,000,000	5,000,000	1%, Jan	197.	25	29	Welsbach Commercial Copfd. Welsbach Light Co	100 100 5	8,500,000 500,000 525,100	• • • • • • • • • • • • • • • • • • • •	2 X Q	115/4 57 \\ 42	57 45
* Un'inted. † Paid in. † Fuil a Leased to Hestonville, Man &	Fair	mount Pa	asengar K	v for 6 %	on stock	per a	nnum	Welsbach Light Co., Canada	5	500,000	******	••••	10%	
b Considitation Electric, Peo charges and ad indebteduess of c	pie's	and Phi	ladelphia	Traction	compan	ies.	Fixed		100	200,000	200,000		<u></u>	
Traction Company. c Practically all shares owned d Lease to Frankford & Southw	he II	nion Traci	tion Comp	19 n 17				MiscellaneousJan .9:	190	1,000,000	1,000,000	9	170	171
e Leased to Electric Traction C f Controlled by Frankford & S	om D	anv.			ecifie Tr	mC1101	u ∪ <b>o,</b>	*Barney & Smith Oar Cocom. *Barney & Smith Oar Copfd.	100 100		1,000,000 2,500,000	ī x	21 98	25 103
g Leased to Peopte's Passenger h Majority of stock owned by I	Raii 'eopl	way at \$5   le's Tracti	per share	•				Billings & Spencer Co	25 100	1.250,000		1% % Fob. '98	55	67
4 Leased to Union Traction Con j Lease transferred to Union Traction C jj Leased to United Traction C	a 11.	in Compar	1 <b>y</b> .	110 000 -			000 = 0	Johns-Pratt Cocom. Pratt & Whitney Copfd	100 100 100				4	.5 8
	om pi	SUYBE & P	enski of \$	no ou per	annum	in l	000-7-8	illwell-Bierce Cocom.	100				4/	54
p.a. \$20,000 in 1879-1900 and \$30 0 0 declared as a dividend semi-annus k Dividend of 10 % guaranteed	oer:				cini- <b>a</b> mina	ши,	LCD to.	hults Belting Co				2 % Sept 1, 94,	96	98

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# BONDS.

PASSENG	SER R	rug dec di y P					PASSEN	GER N	AILWI	47.			
	Amou	ut.		Interest				Amo	unt.		Interest		
NAME.	Authorized.	Issued.	Due	periods.	Bid.	Askod.	NAME.	Anthorized.	Issued.	Due	perrieds.	Bid.	Aske
Albany N. Y.  I ate of Geotatics — Jan 29, 1800  The Albany Ry. Co Gen. mig. 5s., 1The Albany Ry. Co Gen. mig. 5s. 1Watervleit Turnpike & RR.1st mig. 6s. IWatervleit Turnpike & RR.2d mig. 6s. Troy City Railway Co	8500,000 750,000 850,000 150,000	427,500 875,000 850,000 150,000	1947 1919	M. & N. M. & N. M. & N.		1271/2	New Orleans La.  Dete of Quotation—Jan 29, 1900 Canal & Claiborne RR cons mig. 6s. Crescent City RR	\$150,000 5,900,000 416,500 5,900,000 850,000 800,000 800,000	50,000 8,000,000 899,000 2,599,500 850,000 800,000	1899 1948 1908 1948 1907 1912	J. & D. J. & J. F. & A.	105%	112 118
Principal and interest guar. by Albany Ry. Co.  Baltimore Md.  Date of Quotation—Jan 29, 1100.  United Electric Ry. Colst mtg. g. 4s.  "mincome 4s. Baltimore City Pass. Ry. lst mtg. g. 5s. Baltimore Traction Colst mtg. g. 5s. Bal. Trac. Co. No. Balto div. lst mtg. g. 5s. Bal. Trac. Co. Coll. Trust, lst mtg. g. 5s. Baltimore Traction Co. Convertible 5s. Central Pass. Ry. Co	2,000,000 1,500,000 1,250,000 1,750,000 750,000 800,000 96,000 604,000 8,000,000 1,000,000	1,250,000 1,750,000  117,000 580,000 8,000,000	1949 1911 1929 1901 1942 1900 1906 1912 1982	J & D. M. & N. M. & N. M. & S. J. & D. J. & J. N. & M. J. & J. M. & N.	102 74% 1187% 119 104% 121 101 102% 118 117	102½ 75 120 121½  121 117	1890,000 outstanding.  New York.  Date of Quotation—Jan 29 1800  Atlantic Ave. (Brooklyn)lmp. g. 5s. Atlantic Av. (Brooklyn)lstgen. mtg. 5s. †Atlantic Av. (Brooklyn)lons. mtg. 5s. Bro'dway & 7th Ave	4,500,000	1,966,000 7,650,000 1,500,000 500,000 1,125,000 1,000,000 6,000,000 2,000,000 448,000	1909 1981 1948 1904 1914 1924 1905 1941 1989 1988 1941 1941	M. & S. A. & O. J. & D. J. & D. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J.	95 1073/2 115 128 104 108 115 116 115 101 104 112 107	110 116 125 105 110 117 106 117 116
### All of the bonds of the above companies, marked t, have been assumed by the United Railways & Electric Company.  BOSTON, MASS.  Date of Quotation—Jan 29 1500.  **tLynn & Boston RRlst mtg. g. 5s. West End Street RyDeben. g. 5s. West End Street RyDeben. g. 4%s.  ###################################	5,879,000 8,000,000 2,000,000	2,000,000	1902	J. & D. M. & N. M. & S.	114 104% 112	115 106 	Brooklyn Rapid Transit	1,200,000 250,000 800,000 1,100,000 1,200,000 1,500,000 5,000,000 12,500,000 12,500,000 1,600,000 800,000 1,500,000 850,000	700,000 1,200,000 250,000 800,000 980,000 1,100,000 1,200,000 1,500,000 5,000,000 1,500,000 1,500,000	1900 1902 1922 1908 1982 1914 1914 1915 1998 1997 1909 1909	J. & D. M. & N. J. & J. J. & D. F. & A. F. & A. M. & S. F. & Å. M. & S. J. & J. M. & S.	109% 101% 107 125 101 117 102 108 116% 89 124 120 120 1'8% 116	108 109 109 105 117 125 121 109 112 112 128
†Enterprise Street RR	500,000 850,000	47,000		J. & J	103	TAS	Third Avenue RR lst mtg. g. 5s. Twenty-third Street Ry lst mtg. 6s. Twenty-third Street Ry Deb. 5s	150,000 2,000,000	150,000 2,000,000	1909 1906	J. & J. J. & J.	106	118
Chicago III.  Date of Quotation—Jan 29 1900.  Ohicago City Ry	400,000 1,000,000 7,500,000 1,500,000 4,040,000 7,574,000 15,000,000 8,171,000 500,000 2,500,000 4,100,000 2,700,000	500,000 7,500,000 750,000 4,040,000 8,781,200 15,000,000 500,000 2,500,000 8,969,000	1908 1929 1929 1907 1982 1928 1942 1906 1911 1900 1927 1928 1911	F. & A. J. & D. A. & O. J. & J. J. & J. J. & J. J. & J. J. & J. M. & N. M. & N. J. & L.	1013/4 	102½ 102 102 109 96‰ 111 102 107	Union (Huckleberry) Ry Isi mig. 5s. 1; Westchester Electric RR Ist mig. 5s. 1; Ill conditions and the state of the	500,000	500,000	1948	J. & J. M. & S.	110	114
IW. Chicago St. RR. Tunnel Ist mig. 5s. †Redeemable at option on 60 da. notice. If unded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee. †Subject to call after Oct. 1, 1899, at \$110 and interest. †Assumed by W. Chi. RR. Co., lessee. †Int. guar. by W. Chicago St. RR. Co. Cincinnati, O. Date of Quotation—Jan 29 1600  Cincinnati, O. Date of Quotation—Jan 29 1600  Cinc. New. & Cov. St. Ry. 1st Con. mig. 5s. †Mt. Adams & Eden P'k In 1st mig. 6s. †Mt. Adams & Eden P'k Inc. Cons. mig. 5s. So. Cov. & Cin. St. Ry 1st mig. 6s. †So. Cov. & Cin. St. Ry 1st mig. 6s. †Assumed by the Cincin. St. Ry. Co.	8,000,000 48,000 100,000 531 090	2,500,000 48,000 100,000 531,000	1909 1922 1900 1905 1906	F. & A.	118 % 108 % 1 1 4 108 3 4 12 1 % 182 3 4	1141/ <sub>4</sub> 104	Date of Quotation Jan 29 1100  Continental Pass. By	850,000 800,000 100,000 150,000 250,000 5,698,210 200,000 1,125,000 1,800,000 1,000,000 29,735,007 250,000 750,000	200,000 1,018,000 100,000	1898 1901 1905 1911 1912 1948 1910 1917 1908 1911 1945 1905	A. & O.		
\$250,000 reserved to retire 1st mig. bds.  Cleveland, O.  Date of Quotation— Jan 29 1500  aBrooklyn Street RB. Co1st mig. 6s. Clin. New't & Cov. St. Ry Cons. mig. 5s. Cleveland City Cable Ry1st mig. 5s. Cleveland Electric Ry.Co. 1st mig. 5. Cloveland Electric Ry.Co. 1st mig. 5. Columbus (O.) Cent. Ry1st mig. g. 5s. LEast Cleveland RB1st mig. g. 6s. Least Cleveland RB1st mig. 6s. St. Ry. Co., Grand Rapids 1st mig. 6s. \$1, Wayne (Ind.) Elec. Ry. 1st mig. 6s. \$1, 1900,000 in escrow to retire bouds of theoreted companies, marked a. Interest guar. by Cons. St. Ry. Co.	600,000 8,000,000 2,000,000 8,500,000 1,500,000 1,000,000 600,000 200,000	2,500,000 2,000,000 1,249,000 1,500,000 1,000,000	1922 1909 1918 1918 1910 1922 1915	J. & J. M. & S. M. & N.	106% 1181% 105% 106	107 114 \ 106 107 	Pittsburg, Pa.  Date of Quotation—Jan 29 1100  Birmingham, Knox & Allentown	500,000 875,000 1,250,000 1,500,000 50,000 1,250,000 250,000 1,500,000 1,500,000 1,500,000 1,500,000 2,500.000	750,000 1,500,000 500,000 1,400,000	1980 1927 1980 1918 1942 1928 1924 1927 1929 1922 1980	M. & S. J. & J. A. & O. J. & J. J. & J. J. & J. A. & O. M. & N. J. & J. A. & O. J. & D. V. & S.	110	118
DetPoit, Mich.  Date of Quotation—Jan 29 1000 Detroit Citizens' St. Ryist mig. 5s. t. Wayne & Belle Isle Rylst mig. 6s. he Detroit Ry	1.800,000	8,885,000 877,000 1,800,000	1902	A. & O. A. & O. J.&D.	105	102½ 106½	Providence R. I.  Date of Quotation - Jan 29 1100	50,000 9,000,000		1910	J. & D.	114	110
New Haven Conn.  Date of Quotation—Jan 29 1100  New Haven St. Rylst mtg. g. 5s.  New Haven (Edgewood Div.)lst mtg. 5s.  Winchester Avenue RR—lst mtg. g. 5s.  Winhester Avenue RR,Deben, g. 5s,	250,000 100,000		1914 1912	J&D M&N M&S	111 111 109 		Date of Quotation - Jan 29 1100 Baden & St. Louis RR	₹000 000 1 600 000 2,000,0:0 1 060 000	250,0°0 1,60°,000 1,500,000 000°000	1912 907	J & J J & J J& J	100 2 109 117 With	703 102 109 118

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# PARRENGER BAILWAY

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RAPE.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
St. Louis.						
Date of Quotation-Jan 29, 1900	ł			1	1	
efferson Avenue Bylst mtg. 5s.	400,000	400,000	1905	M. & N.	103	105
indell By. Colst mtg. 5e	1,500,000	1,500.000	1911	F. & A.	1(8	103
seouri RB. Co	1,000,000	700,000 800,000		M. & S. A. & O.	105 100	106 102
lound City <b>BB. Oolet mtg. 6</b> 8. ople's BB. Oolet mtg. 68.	125,000	125,000	1902	J. & D.		
eople's RR. Co2d mtg. 75-	75,000	75.000	1902 1904	M. & N.		
ople's RR. CoCons. mtg. 6s. Louis & E. St. L. Electriclst mtg. 6s.	1,000,000 75,000	800,300 75,000	1905		100	101
. Louis RR. Colst mtg. 5s.	2,000,000	2,000,000	1900	M. & N.		100%
t, Louis & Sub, Bylst mtg. g. 5s. . Louis & Sub, ByIncome 5s.		1,400,000 800,000	1921	F. & A.	108	104
Southern Electric ByCons. mtg. 6s.	500,000	500,000	1909		106	108
Caylor Avenue St. Bylst mtg. g. 6s.	500,000 1,091,000	500,000 1,091,000	1918 1900		116	118
nion Depot RR, Colst cons. mtg. 6s. nion Depot RR, CoCons. mtg. 6s.			1918		121	122
Controlled by St. Louis RR. Co.					l	
Controlled by Union Depot BB. Co.	!				i	
Controlled by Lindell B.R. Co. \$200,000 in escrow to retire 1st & 2d						
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\$500,000 in escrow. (†\$200,000 in escrow to retire 1st mtg.			1		1	
f			1			
San Francisco Cal.						l
Date of Quotation- Jan, 1900.	1 000 000	000 000	1015		1	
ifornia St. Cable BRist mtg. g. 5s. erries & Cliff House Rylst mtg. 6s.		900,000 650,000	1915	J. & J. M. & S.	114	117
ry St., Park & Ocean BRlst. mtg. 5s.	1,000,000	671,000	1921	A. & O.		95
ket St. Cable Ry. Colat mtg. g. 6s. tropolitan Ry. Colat mtg.	8,000,000 200,000	8,000,000	1918	J. & J.	1263	•••••
mibus Cable Colst mtg. 6s.	2,000,000		1918		126%	
k & Cliff House B.Blst mtg. 6s.	850,000 250,000	850,000 250 000	1912 1914	J. & J.	1051/4	
rk & Ocean RRlst mtg. 6s. well St. Rylst mtg. 6s.	700,000		1912	J. & J. M. & S.	115	125
ter St. Ry. Colst mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	•••	
ontrolled by Market St. Ry. Co.						}
Washington D.C.						
Date of Quotation—Jan 29 1500	500,000	450,000	1930	J. & J.		
By. Co	500,000	500,000	1914	A. & O.	182	
ington & Soldiers' Hom . mtg. 6s.	200,000		1911	J. & D.		
tropolitan RR. CoColl tr. cons. 6s, \$50,000 in escrow to retire 1st mtg.bds,	500,000	500,000	1901	J. & J.		•••••
Miscellaneous.	İii				l	
Date of Quotation-Jan 29, 1900.	ļ					
geport Traction Oulst mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
falo (N. Y.) Ry. CoCons. mtg. 5s.	5,000,000	8,543,000	1931	F. & A.	118	
izens' St. R. (Ind'polis).1st cons.m.5s osstown St. Ry. (Buffalo)1st. mtg.5s.	4,000,000 8,000,000	8,000,000 2,366,000	1932	M. & N.	104 112	10 <b>5</b> 11 <b>8</b>
lumbus (O.) St. Rylst cons. g. 5s.	8,000,000	2,261,000	1932	J. & J.	115	
nsolidated Traction (N. J.)lst mtg.5s cosst'n St. Ry. (Colu's, O.)lst mtg.g.5s	15,000,000 2,000,000	18,965,000 572,000	10001	J. & D.	11114	1113/8
nver City Cable Rylst mtg. g. 6s.	4,000,000	8,800,000	1920	J. & D. J. & J.	115 20	1167
nver Con. Tram'y CoCon. m. g. 5s. uisville (Ky.) Rylst cons. mtg. g.5s.	4,000,000	922,000 4,981,000	1933	A. & O.	80	85
inneapolis St. Rylst cons. mtg. g. 5s	6,000,000 5,000,000	1,050,000		J. & J. J. & J.	1101/4	1101/4
io. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	8,000,000	2,378,000	1928	1 & 1	108	
. Hudson Co. Ry. (N.J.)2d mtg. 5s. . Hudson Co. Ry. (N. J.)Deb. 6s.	550,000 500,000	550,000 489,000	14417	T A A	••••	•••••
erson (N. J.) ByOons. mtg g. 6s.	1,250,000					
chester (N. Y.) Rylst mtg. 5s. Paul City RyOons. g. 5s.	8,000,000 5,500,000	2,000,000 4,298,000	1980	A. & O.	l	
Paul City ByDeb. g. 6s.	1,000,000	1,000,000	1900	•••••	105 1/6 103	106
\$1,000,000 in escrow to retire 1st and	· '		- 1			••••
mtg. bds.	1	l				
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ffalo Ry. Co. 8760,000 in escrow to retire bonds of	ļ	.	į		l l	
C. St. RR. Co.	1	ł	ŀ			
487,000 in treasury. 8980,000 res'ved to redeem prior liens.		1				
#8520,000 in escrow.	. 1		- 1			
·	i	1	- 1		*Wish	nt'rest

### ELEOTRIO LIGHT AND ELECTRICAL MFG. COS.

Boston, Mass Date of Quaration—Jan 29 1900						
Delaware Gas Lt. Co.,lst m. 5s, g. Edison Glec. Illuminating Oo., Boston		800,000		J. & J. Quar.	106 157	•••••
General Electric Cogold coup, deb. 5s	10,000,000	8,750,000	1922		116	•
Pittsburg Pa  Date of Quotation—Jan 29, 1900						
Allegheny County Light Co 6s. Westinghouse Elec. & Meg. Co. Scrip 6s.	500,000 195,570			J. & J. M. & S.	110	•••••
Miscellaneous(Jan 29 1900.)		1				
Edison El. Illg. Co. (N. York) 1st m. 5s	4,812,000	4,812,000	1910		109	•••••
Edison El. Illg. Co. (N. Y.) con. m. g. 5s. Edison Elec. Illg. Co. (Brooklyn)	15,000,000 5,000,000	2,188,000 5,000,000	1993 1940		124	124
Edison Electric Light (Philadelphia)	2,000,000	8,000,000	1910	*******	12274	121
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,500,000	2,500,000	1937	A. & O.	100	10;
Kings Co. El. Lt. & Po. Co.pur. money 6s	5,176,000		1997		120	122
Milwaukee El. Ry & Lt. Co.lst con. g. 5s. United Elec. Light & Power Co(N. Y.)	8,000,000 5,000,000	6,103,000		F. & A.	102/2	• • • •

#### TELEPHONE AND TELEGRAPH.

Miscellane : us.  Date of Quotation—Jan 29: 1900					100%	101
American Bell Telephone78.			1908	F. & A.		••••
Northwestern Telegraph Co	*******	*****		•••••	*:::	•••••
N.Y J. Telep & Telg Oo. gen.mtg.5s Chesapeake & Potomac Teleph. Co5s.			1911	J. & D.	114 108	115 106

#### ALLIED INDUSTRIES.

Miscellaneoue.  Date of Quitation—Jan 29, 1100						
American Electric Heating	75,000	<b>5</b> 90 000	1942 1904	J. & J J & D.	106	25 107

### NOTES FOR INVESTORS.

Late quotations for copper are : Electrolytic, 15%@16c.; Lake, 16@16½c.; casting, 15½@15%c.

The Northern Ohio Traction Company has declared its first semi-annual dividend of 2½ per cent. on its preferred stock, payable February 1.

The New England Telephone and Telegraph Company has declared the regular quarterly dividend of \$1.50, payable February 15.

It is understood that some changes are to be made in the directorate of the Pennsylvania Electric Vehicle Company at the annual meeting of stockholders, Febru-

A receiver has been appointed for the Ballston (N. Y.) Terminal Railroad, a twelve mile county trolley, owned by Philadelphia capital and bonded for \$250,-

The Brooklyn Rapid Transit Company's annual meeting was a harmonious affair. The new directors elected were August Belmont, H. H. Porter, N. G. Oakman, A. R. Flower and F. P. Alcott.

The Metropolitan Struct Railway Company of Kansas City, Mo., has increased-its dividends from 4 per cent. a year to 5 per cent. Dividends are paid to stockholders quarterly.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Blat, 18½ 420; New York Electric Vehicle Transportation, 9(494; New England Transportation, 6(46).

On February 15, the quarterly rental of 113 per cent, will be due and payable on the slock of the West Chicago S reet Railway. The transfer books will close February 5 and reopen February 16.

A mortgage for \$1,000,000, to run twenty years, at 5 per cent. was filed for record last week at Toledo,  $\Theta$ . It is given by the United States Telephone Company to the Cleveland Trust Company.

It is announced that the reorganization committee of the Chicago Electric Traction Company has notified its counsel, Lovy Mayer that the \$500,000 of first mortgage 5 per cent bonds are ready for distribution.

The volume of business transacted on the New York Stock Exchange aggregated 1,314.879 shares—the smallest total recorded for over a year. This time a year ago the sales exceeded a million shares a day.

The Massena (N. Y.) Electric Street Railway Company has called a meeting of the stockholders for the purpose of increasing the capital stock from \$100,000 to \$125,000. It is understood that the road is to be built this year.

The recent strength of Brooklyn Rapid Transit stock is attributable in a large measure to the association of H. H. Porter's name with the management. It is expected Mr. Porter will be chairman of the executive committee.

The mayor of Worcester, Mass., says that "if the Worcester Traction Co. persists in its purpose of declaring a dividend on its \$3,000.000 of common stock—all water—it will have to deal with the city of Worcester as a corporate body."

Both houses of the New York Legislature have passed the rapid transit bill, authorizing New York City to 1841 \$35,000,000 in binds for the underground railway. Contractor McDonald says he will be backed by a company of well-known finan-

The Illinois Electric Vehicle Transportation Company announces "that the payment of the second installment of \$5 a share, due on February 1, is further expayments of the second instantment of \$1 a share, due on reordery 1, is further ex-tended to July 2. without interest, as the company has adequate funds to meet pres-ent requirements."

The Bridgeport (N. J.) Traction Co., reports as the net earnings for the month of December \$13,348, an increase of \$5.585 over the corresponding month in 1898. For the six months ending with December the net earnings were \$92,364, which exceeds the similar period in 1898 by \$8,144.

exceeds the similar period in 1898 by \$8,144.

It is reported that the Massachusetts Electric Companies are making a very handsome showing in net earnings. This is largely the result of combined operation and management, but partly the result of the freedom from snowstoims this winter, always an expensive item with suburban roads.

The United Traction Company of Albany, N. Y., has decided to increase its capital stock from \$4,000,000 to \$5,000,000. The funds thus obtained will be used to pay off the debenture bonds of the Troy City Railway, amounting to \$399,700; the floating debt of the Troy City Railway, amounting to about \$200,000, and that of the Albany Railway, amounting to about \$100,000. The remaining \$300,000 will be used for improvements to the Troy Division.

The news comes from Detroit that the Eric Telephone Company will not see

The news comes from Detroit that the Eric Telephone Company will not get possession of its latest acquisition, the Detroit Telephone Company, for which it paid about \$1.250,000, without a legal struggle. Two of the largest interests among the minority stockholders of the Detroit Company are said to be Henry A Everett of Cleveland and the estate of the late Albert Tack.

A circular has been issued announcing a merger of the Electric Axle Light & Power Company with the Consolidated Railway Electric Lighting & Equipment Company. Issae L. Rice is President of the latter and chairman of the board of directors of the former company. Electric Axle is to receive 67 per cent. in stock of the Consolidated Company Deposits of stock are to be made by February 3.

Kuhn, Lieb & Co', New York bankers, have distributed a circular letter to their friends inviting them to become members of a syndicate to finance the Third Avenue Railroad Company of this city. The amount of the syndicate and particulars are not stated and the formation of the syndicate itself is subject to an expert examination of the property, which will not be completed until the end of this week. week.

The properties of the Cincinnati & Hamilton, the Miami Valley Traction and Dayton Traction companies have been consolidated. The new road will be known as the Suthern Ohio Traction Company, with an authorized capital of \$2,000,000 and an authorized bond issue to the same amount. The combined lines of ver a distance of 52 miles. The capital interested is mostly that of Cleveland, Akron and Hamilton. and Hamilton.

The minority bondholders of the Lake Street Elevated Railroad of Chicago are preparing to apply for the appointment of a receiver for that property. Their action is sustained by the recent decision of Judge Jenkins in the United States Circuit Court of Appeals. That decision was made in the case of William Ziegler and others against the Lake Street road and was in favor of Mr. Ziegler and the other minority bendholders.

Samuel D Dekenson of New York has applied for an injunction restraining the Consolidated Traction Company, of New Jersey from paying a dividend on the company's stock. It is the second annual installment of \$150,000 paid by the North Jersey Company under the lease and the Whitney sydicate is largely interested in both corporations. A suit is pending to have set aside as fraudulent the lease by which the Consolidated turned over its lines. Until this latter is decided the countrefuse to interfere in injunction proceedings. court refuses to interfere in injunction proceedings.

Vol. XVIII.

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NEW YORK, FEBRUARY 7, 1900.

No. B

# PLECTRICITY

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#### EDITORIAL NOTES.

The Ouestion of Sheathing on-Men-of-War.

In the issue of ELEC-TRICITY of February 15, 1899, there appeared an article entitled " Electroplating of Ves-

sels' Hulls," in which a method of applying a copper coating directly to an iron or steel hull by means of a flexible and movable path, was described. This process was given a practical trial on an ocean going tug, with the result that after being in the water for several years a careful examination of the vessel's bottom failed to reveal any signs of electrolytic action. Mr. A. A. Knudson, the well known electrolytic expert, who made the examination, after referring to the fact that no trace of galvanic action could be found, said:

"One feature of this method of plating has greatly impressed itself upon my mind during the examination of this boat. I refer to the excellent condition of the surface of the copper plating. I am told by those who have been connected with this boat since she was plated four years ago that her bottom has not been cleaned during that time. With the exception of two places, on and near iron patches, where barnacles to a small extent have collected, the entire balance of the bottom is free and clean from any sea growth of barnacles or anything else pertaining to the sea."

In view of the excellent results obtained by the above mentioned process, the majority and minority reports of the Board of Construction on the question of sheathing recently transmitted to Congress by Secretary Long are extremely interesting. The majority of the Board, consisting of Rear Admirals O'Neill, Melville and Bradford and Commander Richardson Clover, strongly recommends that the law requiring sheathing for battleships and armored cruisers be repealed.

The report of the majority is supported by a letter from Rear Admiral Sampson, commandant of the Boston Navy Yard, in which he says that on the training ship Chesapeake, water has penetrated between the sheathing and the steel, resulting in the steel being pitted. Now with the electrolytic process already referred to this would be impossible as the copper is not separated from the steel of the hull, but on the contrary forms an integral part of it. As is well known, in order to have galvanic action it is necessary that the steel and copper

should be acted upon simultaneously by a suitable electrolyte such as sea or salt water. With the method of sheathing now generally in vogue such action as this is possible, but where the copper is deposited directly on the steel the sea water comes in contact with the copper only and can in no way penetrate through it to the hull proper.

In view of the excellent results that have been obtained by the electrolytic process of plating vessels' hulls, and in the fact that this process is said to cost but about \$3 per square foot against \$5 per square foot for the old method of sheathing, it might be well for the Navy Department to have one or two of the ships now in course of construction plated in this way. In this connection it is interesting to note that Naval Constructer Gilmore has been instructed to make a report upon the methods of sheathing pursued in Europe.

\* \*

Too Much Johnson.

In a recent lecture before the Manhattan Single Tax League of New York City the Hon. Tom L.

Johnson, who is alway brimful of queer ideaswhen he is not at the front in managing a street railroad—tried to impress upon his audience the fact that the only real way to solve the railroad problem was for the city to own the street railways and give free transportation to the public. As Mr. Johnson is well known in the traction world as a millionaire who acquired his wealth promoting railway schemes, we feel confident that the many friends of ELECTRICITY will enjoy reading the Honorable Tom's latest effusion for the amelioration of social conditions—which was as follows:

"There is but one way to solve the street railroad question, but one way to operate street railroads that they shall give the best results to the public, and that is that they shall be owned and operated by the municipalities. It would be better still if street railroads were not only owned and operated by municipalities, but were at the same time free.

"In our great office buildings the office service is free. The high buildings could not be rented unless they had elevators. And yet I suspect that in the rent bill of every tenant in one of these buildings there is a certain additional charge for elevator service. So if you had free street railroads the value of lands along the roads would be increased. An increase of the taxes upon these lands would follow, and the increase in the value of these lands would many times compensate for the extra outlay in taxes that would be necessary to pay for free street car service.

"Suppose the street railroads were free. There would never be a strike. Some say street railroads operated by the municipality would-interfere in politics. I ask you if they do not interfere in politics now. The reason for this is that you have put into private hands a public function. Only those institutions should be municipalized which are natural monopolies and which depend for their existence upon special privileges at the hands of the city government. Such institutions as the fire department, sewers, parks, waterworks and a few others should always be in the hands of the city. When you begin to dispose of them to private owners you open an avenue for corruption in politics which will inevitably be taken advantage of.

"To those who say the city can't operate street railroads I want to call vour attention to the best managed street railroad that was ever run in this country. That was the railroad on the Brooklyn Bridge. You can always trust much better for the management of such things as these your own agents, whom you can get rid of at your will, than corporations which have a franchise of 999 years to operate the road as they please.

"You ask me how the city could secureroads having such a long franchise. I tell you that there is more bad law in the Dartmouth College case than in any other decision in the law books. But under the present laws, I would suggest that all the value there is in a franchise be taxed out of it by the State Legislature, and then the actual property that is left be purchased at a fair price. Although the Legislature of New York has granted certain street railroad franchises for 999 years, it has not cut itself off from the power of decreasing the fare which the railroads can charge. If the Legislature so decided, it could prohibit the collection of more than one, two or three cents for a ride on a street car. This would soon take all the value out of the franchise.

"Reduced to a fundamental proposition, I do not believe any grant for 999 years is valid against the people. We who respect property rights in those things men have created say that property is so sacred that you shall not use it even to pay a tax. But when we come to other property rights we should no more respect the rights to public highways than we respected the right of the Southern slaveholder to the life of negro slaves."

The Chevalier de Rochas, in one of his scientific studies, said that the "only way a man can become a juggler is by dint of common practice," and after reading the above extracts we are led to believe that the Hon. Tom Johnson is a juggler "for fair"—at least, a juggler of words.

According to Mr. Johnson, he would grant a company a franchise and then "have all the value there is in the franchise taxed out." We hardly think that Mr. Johnson's theory of ethics will be approved of by any right-thinking person—in fact it is an argument that the followers of Karl Marx, the learned socialist, would hardly care to advocate.

Mr. Johnson, when connected with the Nassau Railroad in Brooklyn, quickly realized that the city authorities of greater New York were glad to "rent" the railroad on the Brooklyn Bridge to the traction companies—after it was discovered that the Bridge railroad didn't

pay as a "municipal undertaking," and, if we are not mistaken, Mr. Johnson learned to his sorrow that Gov. Pingree's "three-cent-rail-roads" in Detroit were all up in the air.

To obtain possession of street railways in the way that Mr. Johnson advocates would be a violation of the fundamental law of justice, and we are forced to the belief that all the preaching the Hon. Tom L. Johnson may do as a "millionaire single-tax politician" will not take away a single franchise from the gentlemen he associated with when he was a "common railroad man."

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Ether Waves to Guide Torpedoes. From time to time we have referred in these columns to various electrical inventions and devices that have been

brought out for controlling torpedoes. One of these consisted in placing inside the torpedo a number of electro-magnets which were made to operate the steering gear when acted upon by a current of electricity, transmitted either from the shore or a nearby ship through a cable which was unwound as the torpedo forged ahead. This arrangement, as we stated at the time, embodied several objectionable features, which, to the best of our knowledge, have prevented it being adopted. To do away with the reel of wire, efforts were made to adapt Hertzian waves to the controlling of torpedoes, with the result that at the present time no less than half a dozen systems have been brought out, all more or less resembling one another and differing only in the detail of the apparatus made use of. Even Nikola Tesla investigated the subject, and if we are not mistaken exhibited a model of his apparatus at a dinner given in his honor a short time ago in Chicago. About a year ago two Swedish inventors exhibited before the King of Sweden an electric appliance for the steering of torpedoes actuated, so it was claimed, by means of X-rays. The patent rights were presented as a gift to that country, all the details of the mechanism being kept

In England experiments in ether wave steering have been conducted from time to time at Weymouth, while still more recently Lieutenant Commander J. C. Colwell. United States Naval attaché, in London, witnessed a series of experiments in this line at Yoevil. The inventor of this system for steering torpedoes is Cecil Varicas, an Englishman. The tests recently made were on a comparatively small scale, but were said to have been extremely satisfactory, the model being controlled by a current sent from the shore with no intermediate wiring. Although the exact working of this system has as yet not fully been made public, it is understood the Hertzian waves are made to operate either one of two solenoids, which moves the steering gear either to port or starboard as desired. After the test Lieutenant Commander Colwell is reported as saying:

"I believe the experiments have fully proved the practicability of the theory, but a decisive opinion cannot be risked until the invention has actually been applied to full sized craft and submitted to aqueous atmospheric conditions. If, after that, the principle evinced in miniature should hold good, then it may be said that the day of the present torpedo has passed, and that the present methods of harbor defence are revolutionized."

Lieutenant Commander Colwell will submit

at an early date an exhaustive report on this subject to the Navy Department, which if made public should prove very interesting and throw considerable light on this method of steering torpedoes.

In the Marconi system of wireless telegraphy no means has as yet been devised for preventing interference, and in the case of applying these same waves to the guiding of a torpedo the question arises as to whether a ship provided with induction coils and other necessary apparatus could not nullify the waves sent from another ship or from the shore and thus cause a torpedo to run at random. This would seem another interesting problem that presents itself at the beginning of speculative thinking on this subject.

### UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

Consul McGinley writes from Athens that a company has recently been formed in Athens, known as the Greek Electircal Company, with a capital of \$600,000. The founders are the Bank of Athens and the Societe Generale d'Enterprise. The object is to undertake the electric lighting of Athens, Piraeus, Patras. Syra and Kalamata.

The Northern Pacific announces that with the inaguration of its new double service to Seattle. Wash., in March it will do away with gas as an illuminant and introduce a new system of electric lighting which has not heretofore been attempted on Western roads. Each car, according to the plan, will be independently supplied with lighting power from motors on the car axles. The trains will be hauled by new express engines capable of making as a maximum speed, eighty-five miles an hour with a heavy train.

AT a fire at the corner of Mott and Hester streets, New York, Saturday night the electric searchlights used by the fire department had a good trial. First the square light was used. This lighted up the whole front of the building, and was a material aid to the firemen who were dragging the hose up the fire escape. The lens light was also used and an attempt was made to throw the beams into the basement .-It was not a success and the light was taken from the engine and set on the sidewalk near the building. A coil of wire was then connected with it and the light was thrown into the smoky room. The light did not penetrate the smoke. "There never was a light invented that will penetrate smoke, but the illumination of the smoke will be of great help to the firemen," said Chief Croker.

A PENNSYLVANIAN has patented an electrical switch operating mechanism, which has two pairs of magnets suspended on a bar, to be lowered on either side of the switch and draw the bar in either direction as the current is switched into the magnets by the motorman.

News comes from Tacoma, Wash., of an electrician who has installed in the City Hall of that city an invention of his own, in the way of an incandescent lamp which runs on a trolley arrangement and is a great aid to the registration clerk in his work. From an ordinary rosette, placed high enough on the wall to be out of reach, two bare wires extend a few



inches apart to a hook on the opposite wall, just over the registry counter. A little bar, with hooked metallic connections, from which is suspended an ordinary electric globe, runs along the wires and can be moved backward and forward at will.

THE Berlin correspondent of the London "Times" reports that the German Telegraphs Administration some time ago placed proposals before the British Post Office for laying a new cable between Emden and the English coast. The assent of the British authorities to these proposals has not yet been obtained.

In a paper recently read by Mr. Mariani before the Institute of the University of Rome, Italy, the question of the magnetic disturbances caused by electric street railways was taken up. The author in his conclusions stated that the magnetic materials on a street railway directly affected the compass up to a distance of 150 yards from the line. The further disturbances such as are felt by magnetic observatories, are due to the leakage currents from the earth return, and the range over which these are felt is stated to be some 2,000 yards.

The State Board of Electricity of Minnesota has made the first report to the Governor, from its beginning July 18 to January 6. It has registered 514 electricians by virtue of their standing in the trade when the law began, and 23 by examination. It has given master's certificates to 30, journeymen's to 219 and specials to 288, these last men were working at the trade but probably unable to pass examination. It has held 45 meetings, and received 549 applications.

THE New York "Herald" says that Prof. William A. Eddy, the kite expert, of Bayonne, N. J., is now engaged in seeking a means to harness electricity into a cheaper and better system than that of the dynamo. Three tailless kites, 2,000 feet of threadlike copper wire. an iron rod and a simple switch comprise the harness. Prof. Eddy has progressed far enough to utilize the intense intermittent current for photographic and laboratory purposes. He says the system may become a powerful factor in army signaling and that the future promises to disclose a means of lighting great sky scrapers with electric fluid from the clouds. Prof. Eddy first raises three kites early in the evening. When the kites attain an altitude of from 500 to 700 feet he attaches a collector to the cable, which is made of strong flax. The collector is a light wooden frame about two feet square. It is covered with mosquito netting on which is pasted a large sheet of tinfoil. The netting is used because the tinfoil is too frail of itself, and will not stand the blast of the winds. The air strikes this "collector" on both sides at once. To this collector is fastened a threadlike copper wire. Then the kite cable is paid out until the kites attain an altitude of 2,000 or 2,200 ft. The collector is 610 ft. below the kites, and as it raises above the ground it gathers electricity. The collecting process increases with the altitude. An iron rod driven into the ground near the cable reel serves as a ground for the current. The copper wire, as it leaves the wheel, passes tightly around the rod and then on up the cable. The current is thus rendered harmless. Prof. Eddy said the high buildings in New York could be lighted by electricity gathered from the clouds by means of gigantic collectors, and that the great

problem now is how to insulate the roofs of these structures in order to prevent the current from escaping through the iron frame work into the ground. Millions of volts could be secured from the clouds, he asserted, when this problem is once solved.

The commissioners of Victoria Park, Niagara Falls, Ontario, have granted to a syndicate represented by General George S. Field, of Buffalo, a concession to build a power canal on the Canadian side of the falls, from which it is expected that about 200,000 horse power will be developed. General Field is the representative in this country of the Exploration Company, Limited, of London. The Field syndicate proposes to divert water from the Welland River, to a point on the bluffs overlooking Niagara Falls Park, 'The fall here obtained will permit a development of from 30,000 to 60,000 horse power. By means of an open canal, the stream will then be carried to a point on the precipice overlooking the Niagara, and immediately north of the falls. The second discharge will permit of a further development of 125,000 horse power. The exact terms of the rental to be paid by the syndicate will not be divulged at present, but it is stated that they will virtually be the same as those arranged with the Canadian Niagara Falls Power Company. The latter company has to pay a fixed rental of \$15,000 per annum for development up to 10,000 horse power. For the second 10,000 horse power development the rental is \$1 per horse power; for the third 10,000 horse power, 75 cents per horse power, and for all further development, 50 cents per horse power.

LORD RAYLEIGH, in a recent lecture on "Flight" at the Royal Institution, London, among other things said: "I am disposed to agree with Mr. Maxim (who was among his auditors) that a real flying machine, capable of supporting itself for a considerable length of time, and of being steered in a desired direction, is only a question of time and money." He added, however, that the question of alighting still seemed to him to present very great difficulties, not only because of the impetus of the flying machine, but because of the presence of perplexing and contrary currents of air which would always be met with as the machine neared the ground.

In view of the recent adverse report by a Board of Naval experts on the submarine boat Holland the following paragraph from a London correspondent of a Glasgow paper is significant to say the least: "I have a letter from a French correspondent giving quite rosy pictures of the trials of the new Goubet submarine boat. On the surface it is easily manoeuvered. It was found habitable when 15 feet under the surface for five hours, during which, however, it was stationary. As yet it has not steamed for any length under the surface, although plunges downwards have been made with comparatively slow returns to the surface. On surface level the speed is 6 knots, but when it has done this in unknown waters, at a distance under the surface to ensure no surface motion whereby its locality might be detected, the feasibility of submarine propulsion may be within distance of solution, but not until then. The Narval class, of which six boats have been built, has proved thus far unmanageable; and in view of this and the inconclusive tests of the Goubet, navy experts in France, I hear, are growing doubtful

and morose over the prospects of ultimate success. This, however, will not surprise trained naval architects in this country or in Germany."

The new electric railway to be built on the Peninsula of Yucatan promises to be the longest of its class in the world. It will traverse Yucatan through Chiapas, Tabasco and Campeche, a distance of 403.2 miles, and will cost \$15,000,000.

#### A CARD FROM DR. PUPIN.

Editor Electricity.

Six: Permit me to propose through the columns of your esteemed journal Mr. Charles S. Bradley as candidate for the presidency of the American Institute of Electrical Engineers. I have to support my proposition by a brief review of Mr. Bradley's engineering record. I am aware that I run the risk of offending the code of good form; for sincere appreciation of a man's good work may be looked upon as honest enthusiasm or mere hollow gush, depending on circumstances. It is extremely difficult to speak enthusiastically of the work of a living man and avoid the appearance of being a flatterer. I am prepared to pay the penalty of this appearance.

Mr. Bradley was always connected with big things in electrical engineering. He was the engineer of the Edison Illuminating Company in 1881. Electric lighting was then a huge experiment. It proved a huge success, thanks in a great measure to Mr. Bradley's inventive resources.

The Edison Illuminating Company was then too small for two men like Edison and Bradley. Mr. Bradley transferred his activity to a very modest little laboratory of his own in one of the most secluded little alleys in Yonkers. This laboratory was the birthplace of some of the foremost electrical inventions in electrical engineering. I shall mention a few of them only.

The Electrical Reduction of Aluminum.—A patent on this invention was granted to Mr. Bradley in 1891. The process employed by the Pittsburg Reduction Company at Niagara and by many European companies is based on this patent.

The Method of Multipolar Winding, now so generally employed in the construction of continuous current machinery, was first worked out by Mr. Bradley. He constructed the first multipolar machine in this country in 1887. It was tested by Prof Geyer, of Stevens Institute, and by the Edison Electrical Works at Schenectady, where it created a profound sensation.

The Generation and the Method of Combining Polyphase Electromotive Forces was first developed by Mr. Bradley in 1887. The famous transmission experiment at Frankfurt in 1891 brought Mr. Bradley's name in strong prominence, alongside of the names of Ferraris, Tesla, Wenstrom and Dobrowolsky. Ever since that time he has been known in Europe even better than in his own country.

The first Rotary Converter was built by Mr. Bradley in 1888 and secured for him a broad patent on this invention, which may be regarded as the very backbone of electrical transmission of power.

It is not necessary to go any further into the long list of Mr. Bradley's epoch-making inventions. I have said enough to prove the appropriateness of my proposition.

Most respectfully yours,

M. I. Pupin.

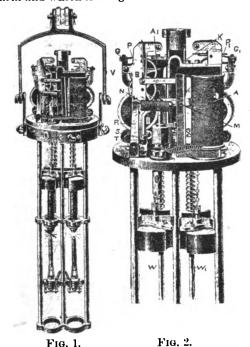


#### TWIN-CARBON ARC LAMPS.

Several of our German contemporaries, says the "Electrical Engineer," London, describe a type of twin-carbon arc lamp, recently introduced by Messrs. Korting and Mathiesen, which has already found some favor on the German market. As Mr. W. Mathiesen, the writer of the description, remarks, many endeavors have been made by inventors to produce a satisfactory arc lamp having two arcs in series. The advantages offered by such a lamp would be, of course, that it might be connected singly across a 110-volt circuit.

A few years back there appeared on the market an enclosed type of arc lamp which so far met this requirement in that it took about double the normal pressure sufficing for an open arc—that is to say, about 80 volts, and could, therefore, be connected to a 110-volt circuit—the lamp, however, failed to completely solve the problem pertaining to high-potential arc lamps, since the well-known hissing of the enclosed light does not permit of the long-burning arc being always employed, besides which the low efficiency of the arc constitutes a further obstacle to its use. These disadvantages can only in a comparatively few cases be neglected

The lamp introduced by the above-mentioned firm and which is designed to overcome these



difficulties, is shown in Figs. 1 and 2. It may be described as a combination of two independent regulating devices which are attached to a common base-plate. The regulating mechanism belongs to the well-known type in which a magnet provided with a hinged armature actuates the regulating clockwork. The arrangement is apparent from the accompanying sketches, which clearly show almost every detail. This regulating mechanism consists of the shunt-wound magnet, a, and the clockwork, b, which latter is connected with the magneto armature, m, by the tongue; o. The necessary opposing force to the magnet is afforded by the spiral spring, n. The corresponding parts of the second regulating apparatus, so far as they are visible in the sketch, are denoted by similar letters, with the addition of the number 1 • -- for instance,  $a_1$ ,  $b_1$ , and so on. The escape wheel, p, of the clockwork, b, is governed by a catch attached to the tongue, G, which in turn is carried by the two-armed lever, r, and this,

together with the second tongue,  $G_1$ , is subjected to the common influence of the heat compensator, K, which according to the temperature attained by the lamp mechanism with constant regulating tension, compensates the backward movement of the pivoted armature, m, by pushing back the lever arm, thereby maintaining the regulating tension of the spring approximately constant.

The variation in weight of the carbon-rods is rendered a negligible quantity by the method used of pivoting the clockwork, so that the regulating tension is not influenced thereby. In order to prevent the jerky movement of the clockwork, air pistons or dash-pots, T, are provided. The potential to the arcs may be regulated by adjusting the screw, s, whereby the pull of the spiral spring, n, is controlled. The advantage which this type of lamp offers is that it may be connected singly across a 110volt circuit, as mentioned above, or in pairs across a 220-volt circuit. This advantage is very apparent where the latter pressure is in question, since it is not every consumer who can employ four to six of the ordinary type of lamp. The twin arc type of lamp, like the Nernst lamp, therefore facilitates the general endeavor to increase the pressure of the current supplied to the consumer. It certainly offers a disadvantage with regard to working cost, which is greater in the case of twin-arc lamps than with single arcs, since instead of one pair of carbons it requires two, which though of somewhat less diameter, cost more for the two pairs. Further, the intensity of light given by the two arcs is not so great as that of one arc consuming an equal amount of energy, for the efficiency of arc lamps increases under normal conditions with the current strength. The enclosed arc type of lamp, compared with the twin-arc type as regards intensity of light, is still considerably its superior. But even if the working costs of the twin-arc lamp are higher than those of the single-arc lamp, argues the writer, the advantage offered by the first type is still so great as to make it of considerable importance in connection with central stations supplying at 220 volts.

#### The Railroad Refrigerator Test in Louisiana.

An interesting test was lately made of railroad car refrigeration by electricity. A run of 118 miles was made over the Louisville and Nashville Railroad, from New Orleans to Pass Christian and back. The refrigerator car was attached to the special Pullman car Olivette, which had on board a party of electrical experts and newspaper men from New York. The refrigerator test was the most satisfactory that has yet been made by the Electric Axle Light and Power Company, which controls the patents for generating electricity from the axles of railroad cars. Just before the start the test thermometers in the interior of the refrigerator car registered 53 degrees Fahrenheit. The car was not opened until the special returned to New Orleans when the thermometer showed a temperature of 40 degrees Fahrenheit. The test was an exceptionally severe one, as the car was practically empty, causing it to sway and run more unevenly than would have been the case had it been loaded. The con-stant swaying and jolting tested to the utmost the electrical mechanism which operates the pumps that force the ammonia through the piping under the roof of the car. The working of the system was regarded as of extreme importance by railroad men, as it means doing away with ice for the cooling of cars that carry all kinds of perishable products from interior points to the principal markets of the country.

### CENTRAL STATION ECONOMIES.\*

BY H. W. FRUND.

It is not the purpose of this paper to dwell minutely upon all the economies that can be practiced in central station work, as they are so many and diversified, according to local conditions which surround each individual plant, that to intelligently handle so profound a subject a vast amount of time and space would be needed, making it almost impracticable and at least a gigantic undertaking, as every one will know who has studied the subject.

It is to the smaller stations that I wish more particularly to direct my paper-stations in cities having less than 30,000 population. In fact, I can conservatively say that out of more than 2,500 central electric stations in the United States 90 per cent. are located in cities of 30,000 or less population. This class of stations is now particularly suffering from socialistic and anarchistic tendencies, and from promoters who have not a dollar invested, who work up municipal ideas in the fertile minds of astute aldermen, who have, strange to say, often more power than the Czar of Russia, and ring in a municipal plant and thereby confiscate bona-fide investments made by and through invitation of the same municipal authorities a few years before.

Stringent economies must be practiced, particularly in cases where a company is forced to compete with all the taxpayers, for such is the case when money is required. To carry on municipal works, a tax levy is made and all contribute through the tax office. Whether or not the tax-payer uses light, he must pay his part to carry on the undertaking, and that, too, whether or not the plant is self-sustaining.

One of the avenues of expense in a central station is the cost of maintenance of meters, caused to a large extent by dust, bugs, spiders, corrosion, etc. We have all learned to our sorrow what damage bugs and spiders seeking warmth in a meter can do. They find it a convenient place to build their nests and hatch their eggs, spin their tiny webs and stop our dollars.

Have you meters of this type of any make? If you have they are unreliable, and an unreliable meter is a dead expense, and you need to stop this expense at once. Before I proceed further I wish to qualify the word unreliable. We all know that an electric meter is nothing more than a motor and is never in the company's favor. The customer has all the gain derived from slowing-up meters caused by dust, broken jewels, etc., and there is nothing in central station work which creates more discord and tests the confidence of your consumers than to have a lot of meters slowing-up and finally stopping. Often meters cease to register altogether during the middle of the month, and while there are several ways of averaging and adjusting bills, yet nevertheless the customer is always suspicious of his meter, particularly after paying two or three months' bills taken from a slow-moving meter and then is called upon to settle upon a newly adjusted meter-reading. You hear, no doubt, as I have frequently, from good, sensible people, that they have no confidence in any meter, be it water, gas or electric. I had an occasion lately to inquire from a person who could not procure electric power service from a lighting company, why he adopted a gasoline motor when

<sup>\*</sup> Paper read at the eighth annual meeting of the Northwestern Electrical Association, Milwaukee, Wis., Jan. 18, 1900.



he could procure a high-grade coal gas for motor service at \$1 per thousand cubic feet. His answer was that he had no confidence in a gas meter and went on to state that for months previous he had been using gas for brazing. work. Wanting to know one day how much gas a particular job of brazing required he noticed the index of his meter. After the work had been completed he again read the meter, and was no wiser, as it had not changed from last reading. He then examined his gas bills and found that for several months previous the bills were nearly of the same amount. He immediately reported the matter to the gas superintendent who caused the meter to be replaced with a new one. Then the trouble began, his bills being quadrupled. I called his attention to the fact that it was charitable to concede that the gas company wanted customers and would wish to retain them by treating them fairly, and that if their rates were satisfactory, certainly their new meter placed would only register the true amount consumed, and that the register of the slow meter which finally stopped and was removed, should not be held against the company, particularly as he could ascertain from time to time a true reading of a meter himself. His answer was that any company that was so careless as to have such an appliance in use would be just as apt to put in a meter that would register too fast, and insist upon the same being correct, and that therefore meters were in his opinion unreliable.

This is but one of the many arguments of consumers; therefore you cannot afford to have a class of meters which require from four to tive inspections per annum if you desire to have and keep the confidence of your customers. It is a useless expenditure. Until lately meters of all makes have been full of imperfections, bringing woe and trouble to the central station men. Suffice it to say that the present time meters, and when I say meters I refer to watt-hour recording meters, are to be had that will fulfill requirements much needed in the past, and that are not only bug, moisture and dust proof, but will also register power which we sell in many forms with accuracy throughout the entire range of load.

With this class of meters, and proper handling and installing, the periodical inspection and expense is not required, and if you have any old type meters that are not dust or moisture proof it will pay to change them as soon as practicable and the savings thereby will be at once noticeable. There are quite a number of good ampere-meters in service in central stations to-day that can be made impervious to disturbing elements by the use of putty in sealing the cases and terminal posts, and if meters are not too greatly overloaded, with no ventilation, will work fairly well.

The company I am engaged with placed in service in 1895 about 150 ampere meters and our expense was more than \$20 the first year for jewels on account of dust and dirt. This was not the only expense as we also had a loss on account of meters not registering accurately.

I caused all meters to be brought into the station where they were overhauled, cleaned and new jewels and shafts placed where there was the least doubt of imperfection, and then sealed the meters with putty at every conceivable place where dust or insects could possibly get into the works, and our loss for jewels and shafts since 1896 has not been five dollars, and further with nearly 200 meter consumers, we have had no meters to overhaul and inspect on

account of running too slow on light load or stopping. We have repeatedly taken out meters to recalibrate and it is seldom we are required to take off the case to readjust.

Speaking of ampere meters at this day, they are not the meters to adopt in placing new orders. The many objections to watt-hour meters, when ampere hour meters were supreme have all been overcome and there is no excuse to-day for purchasing a meter that will require, with proper handling, little or no time in meter-testing rooms, compared with the old types yet in use.

Another great saving in central station work is the calibrating of meters. There are several excellent bulletins to be had from the several manufacturers of meters that should be kept among the files of every testing room, and will clear away much of the dreaded task to the already over-worked superintendents, so that they will take to their work in a testing room with better and more satisfactory results. Do your own testing and repairs; save for your company and as a good man is always worthy of his hire, his company will reward him accordingly.

I would call attention to the calibration of meters. Careless calibrating or badly managed meter practice means the loss of hundreds of dollars and is a matter of great importance. For this work a central station should make the necessary investment in proper instruments and fit up a place, away from the central station, which is not subjected to too much vibration or exposed to dust. In the selection of instruments, among other things, a correct stop-watch is of the greatest importance which, saves time and makes work lighter and testing more rapid.

Every central station should have a meter book wherein is recorded the class and serial number of meters, when purchased, when placed for service, and when taken out and returned, and also a memorandum of all testing done, giving the time of calibrating, cleaning, etc. From this book a slip memorandum can be made showing daily where each meter is located and its serial number. No meter should be placed in service without a ticket having dials to correspond with the face of the meter showing its index, when taken out of meter room, the consumer's name, number of meter, when placed in service, by whom, etc. > When a meter is returned to the station or testing room for any cause, the same course should be pursued as to making out index of dials on the ticket referred to, which ticket should be numbered in series, placed on file in your office, as they go to make up your account books and daily sheets.

With a proper system of accounts and books, expense can be reduced materially, and I file with this paper for the examination of the members of this association, leaflets and blanks which have done wonders in the reduction of expenses of our company. You will see here a book in the nature of an invoice where all bills are pasted seriatim as they are paid. No bills or accounts are paid until first pasted in this book. On the margin of this account, which is "carbons," we mark No. 4 arc, This is transferred to a book showing monthly expenses, to line No. 4 under column of arc dynamo, and is an expense not chargeable to any other account. This book of statement of expenses on the left hand page contains 58 heads of accounts each account numbered, commencing with account No. 1, boiler and furnace, repairs of; No. 2, belting and repairs of, and so on. To the right of these accounts you have as many columns as you may desire, for instance, a column for arc lighting for street use, a column for commercial arc lighting, a column for commercial and residence incandescent lighting, another column for power service, and so on. On the right hand page of this expense book are shown, first, the earnings, then the expenses, then earnings and expenses, showing net earnings, with proper rulings which show the earnings and expenses for the same period during the previous year. On this page you have your monthly balance sheet, which shows the total output in watthours for arc, incandescent, motor work, and the like. From this page you can in a very few moments calculate the cost per arc light unit or incandescent or power service, also show the number of series arc lamps installed, the number of incandescent arc lamps and incandescent lamps installed.

From this condensed statement of expenses if there is anything wrong in any one account you will notice it at a glance. For instance, in carbon account, No. 4, there are good arc light trimmers and there are also very poor ones. Some trimmers use more carbons than others. At different times of the year there is a saving in carbons and without this book you could not well detect it. Each and every account heretofore enumerated in the book of statement of expenses needs monthly examination to successfully detect unnecessary and wasteful expenses in the management of a station. Take the item No. 49 "Waste." waste bills for the year before adopting this record were \$49.80, the year following less than \$10. How did we make this saving? We found out exactly what waste it took in ounces per day to do our work and then held one person responsible for the weighing out for daily use the amount taken from a large box kept under lock and key and made for the purpose. This book was what pointed out to us the frequency of the bills in the first place, and our investigation as to where the waste went caused the adoption of the above methods. A careful examination of the blanks before you, will at a glance show that there are many avenues where you can save small amounts, and altogether worth the while.

You will all concede and do realize that you must have some feasible system to work by if you are to compete with municipal "sharpness." Too much stress cannot be put on the keeping of a good system of books by every company, to the end and with the view of reducing expenses. I have met owners of electric light plants who stated that all they knew of their business, how money was derived from it, was through their bank deposit book only. I have in mind one company in particular, whose method was so lax, and who depended upon their bank book, that they were led to believe that they were making money; they said so, other people and strangers said so; they believed they were making money, but strange to say they are now reaping the whirlwind. They have managed to receive a small interest on their investment, the principal has disappeared and the value of their plant for the amount invested will not bring them 10 cents on the dollar, and on the other hand, they are met with the competition of a municipal plant which has turned out to be as disastrous a failure for the taxpayers.

In conclusion, I will say that all local companies on account of the abnormal increase in cost of supplies, and other conditions heretofore enumerated, have arrived at a point where

better methods will need to be adopted for the prevention of waste, not on cheese-parings and candle-ends method, but by more and more attention to economies of operation, both inside and outside of their stations, and by the use of intelligent methods of charging for current consumed.

# INSTITUTION OF ELECTRICAL ENGINEERS.

(From our London Correspondent.)

It will be remembered that a deputation from the above Institution visited Switzerland for a week's tour in September, and made an inspection of all the electrical engineering works there. The Swiss Visit Committee has now issued its report in which it outlines the leading features in the various undertakings. A special meeting of the Institution was held on Thursday, January 11, at which the report was discussed. The discussion was introduced by Mr. R. E. B. Crompton by "A Comparison between British and Continental Practice in Electrical Engineering."

The data relating to the various electric tramway systems is not only interesting but valuable and is in part as follows:

THE STANSSTAD-ENGELBERG ELECTRIC RAIL-WAY.

(Built 1897-1898. Opened in September, 1898. Visited Thursday, September 7.)

Driving Power—Water from spring with reservoir, 415 meters above the power station Obermatt.

Route—Stansstad-Stans-Engelberg, a part of which from Obermatt to Gherst is laid with rack, the rest with adhesion rails.

Electric System—Three-phase alternating current at 750 volts from generators direct on to the trolley wire. For the other end current raised to 5,000 volts by two step-up transformers and transmitted on overhead conductors to two transformer stations in Dallenwyl and Stans and there transformed back to 750 volts; in addition there are special feeders taken from the generator station and transformer station; two overhead contact wires, the third being the rails; current collected by two bows.

Power Station—Three generators of 180 hp. coupled direct to high-pressure turbines, with a reserve: two separate exciters of 12 hp. direct coupled to high-pressure turbines, one reserve; generators with revolving armatures, holes stamped; three single transformers at 30 kilowatts 750/5,300 volts; liquid resistance used to take loads during descent of cars; two secondary transformer stations having three single-phase transformers of 30 kilowatts at Dailenwyl and Stans.

Route—Total length, 22,500 meters: gauge, 1 meter; rise, maximum on the adhesion track 50 per cent.; maximum on the rack line 250 per cent.

Tram Lines- System Vignole-Adhesion rails, rack system Riggenbach.

The Electric Conductors—Circuit breakers in the trolley line; wooden masts used throughout; telephone wires on the same masts.

Rolling Stock—7 cars each with 3 synchronous motors of 35 hp. (total 490 hp.) and with single-gear reduction; speed regulated by resistance inserted in the rotor circuit, by means of slip-rings and brushes; electric heating and lighting by special transformer in car; 3 electric locomotives with motors of 150 hp. (total 450 hp.) regulation as in the above case; wagons for carrying goods; each locomotive is fitted

with several mechanical hand and automatic brakes.

#### THE JUNGERAU RAILWAY.

(In construction since 1897. A part opened in the summer 1898. Visited Friday, September 8.)

Driving Power—Water power from the White Lutschine near Lauterbrunnen.

Route—Wengernalp-Jungfrau. At present trains run from Wengernalp to Eigerwand (3 kilometers).

Electric System—Three-phase current with 7,000 volts transmitted from generators by overhead wires; transformed to 120 volts for the lighting of Lauterbrunnen and Wengen, for boring, and at stations; transformed to 500 volts for locomotives and building purposes; 2 overhead contact wires, third through rails; connection made by two trolleys and slide contact-maker.

Power Station—Fall 40.8 meters, dam, sluices and grated doors, iron pipe 1,630 + 700 meters long; machine house for 4 turbines of which 3 are of 500 and one of 800 hp., system "Girard" with horizontal shafts and having two wheels at 380 revolutions; two turbines of 25 hp. at 600 revolutions for excitation; all turbines automatically regulated.

Electric Generators—2 units of 500 hp, and one of 800 hp, coupled direct (and insulated) to turbines; 380 revolutions per minute, 38 cycles, 7,000 volts, three-phase current; inductor type (stationary windings), high pressure, prepared and formed and then laid in slots.

Exciters—2 of 25 hp., shunt wound, direct-coupled to separate turbines; switching arrangements for parallel running and voltage regulation by exciter voltage, for three-phase or single-phase current (the latter case for lighting with one-phase).

Primary Conductors—Throughout bare wire overhead, on three-fold porcelain bell insulators mounted on masts of wood, with a maximum of 10 per cent, loss; power and light separate; There is a line length of 10 kilometers for the railway and also 3 kilometers for lighting; the wires from generator station to railway have a rise of 1,500 meters,

Lightning Protectors - Siemens & Halske horn-type lightning protectors at each end of the conductors, and on every pole is a pointed wire connected to the earth: transformer station in separately built houses, differing according to the lighting requirements: for the railway are two (later 3) transformers of 200 kw., 500 volts secondary pressure: in the lower part of the railway they are 2 kilometers apart, in the upper part (in tunnel) a station at each kilometer; transformers with 3 vertical iron cores, primary and secondary coils placed conaxially over one another.

Contact Wire of the Railway—Two wires of 9 mm, diameter of hard drawn copper fixed to wires drawn at right angles to contact wire, insulated and mounted on wooden masts. These masts also carry the feeders; rails, joined by railbonds, from the third conductor.

Present Route—Open way 2 kilometers; tunnel 1 kilometer; gauge 1 meter; Vignole rails and rack; average rise on the open 120 per cent, average rise in the tunnel 250 per cent.

Rolling Stock—4 locomotives so arranged that part of the wagon rests on the locomotive; each locomotive has 2 motors with a maximum output of 200 hp.; electrically heated and lighted.

Electromotors—8 small motors with threephase current for driving ventilators, pumps, etc., in tunnel work, altogether 50 hp.

Rock-boring Machines—Electrical percussion boring machines on the solenoid principle, continuous current, 6 machines being worked in the tunnel and 6 in reserve.

THE BURGDORF-THUN ELECTRIC RAILWAY.

(Built 1897-1899. Opened July, 1899. Visited Saturday, September 9.)

Driving Power—Water power at the Kander station.

Route—From Central-Bahn-Bahnhof Thun over Konolfingen (crossing the Bern-Luzern Railway) to the Central-Bahn-Bahnhof Burgdorf; the route Burgdorf-Hasle is worked in common with the Emmenthal steam railway The gauge is normal and the railway has its own line of rails.

Electric System—Three-phase current; tension of 4,000 volts at the Kander station and raised to 16,000 volts: transmission by overhead lines along the railway to the transformer stations, and there reduced to 750 volts; two contact wires and the rails form the three leads; trolley of the bow type.

Route—Total length of line 40,000 meters; three tunnels together 350 meters long; railway 536 to 770 meters above sea level; 3 large iron bridges and many small ones; gauge normal; minimum radius of curve 250 meters; maximum rise 25 per cent.

Rails—Cast-steel Vignole profile, weighing 36 kilogrammes per meter on iron sleepers for one-third of the distance; wood sleepers for two thirds of the distance.

Electric Conductors—High-tension conductors separate, not always following the railway, mounted on wooden poles; nearest point (starting point) of the railway 9 kilometers from the Kander power station; 3 wires of 5 mm. diameter copper; 45 meters average distance between masts, 5 per cent. maximum loss; 49 kilometers length of line and 27 tons weight of copper; contact wire, 750 volts, 2 overhead wires, hard copper 8 mm. diameter; holding up wires 35 meters (average) distance apart, with double insulators: 40 kilometers length having a copper weight of 36 tons and 15 per cent. loss.

Transformer Stations—14 distributed over the length of the route, in stations, each provided with transformers of 150 kilowatts in ribbed boxes and immersed in oil, and without further cooling: the transformer stations serve as towers for the wires and have forked lightning arresters with water resistances; a special wagon is used for making repairs and conveying the transformers.

Rolling Stock-2 electric locomotives with two axles coupled, 2 synchronous motors 300 hp, and cogwheel reduction; carriages for goods and passengers, total weight 28 tons, electrical equipment 10 tons: 6 automobile carriages, 4 axles, i. e., with two bogies with two synchronous motors together 240 hp., and 66 seats, total weight 32 tons, electrical equipment 84 tons: locomotives and automobiles carry in front 2, and behind 2, contact bows to conduct the current to motors: locomotives and automobiles have the speed regulated by a variable resistance in the rotor circuit; they have small three-phase motors driving the air-compression plant of the Westinghouse brake; they can always be coupled to any carriage of the Swiss standard railway; they contain small transformers and switches for electric lighting and

electric heating.

Driving—Single and double passenger trains: consisting of two automobiles with carriages; speed 36 kilometers per hour (single train 55 tons) goods trains with locomotives run at half speed; steam engine in reserve.



#### PROGRESS OF AUTOMOBILES.

# Present Vehicle is the Result of a Long Period of Experiments.

With the advent of motor vehicles comes the search to find out the true history of self-propelled vehicles. From the most reliable sources it has been ascertained that automobiles were made more than 125 years ago by Cugnot, in France. It was a steam propelled wagon of an extremely crude appearance, but was the forerunner of the successful motor vehicles now seen in operation. It might be stated that Paris, up to a year or two ago, has always been the hotbed of automobiles, some of the great inventors in this line being Hancock, Church, Dietz, Gibbs and Frazier.

Hancock did his work during the year 1825, but did not complete his first motor until after five years' work. It was known as "The Infant," according to automobile history, but after two or three runs was declared to be hardly a success. A year later he built another wagon that cost about \$3,500. It burned about twelve tons of coke per hour and weighed about three tons. It could only travel on the best of roads at a speed of ten miles an hour, but withal could be termed the first successful motor vehicle.

Church later on built a vehicle to carry fifty passengers, being all out of proportion, and a few years previous to this time one Gurney built a carriage in England propelled by steam that made such frequent trips to the repair shop it was retired. It could not stand the severe strains of the uneven roads.

It was along in the fifties when Richard Dugeon constructed a wagon propelled by steam made to carry ten people.

Ten years ago France began to talk more of the automobile industry, and has advanced with rapid strides until it is now considered by many to lead in this line with America close on its heels. All classes of motors are in use in Europe, including hydrocarbon, gasoline, electricity and steam, with the gasoline more in favor. It was not until six years ago that America began to pay much attention to the business, and even a race, organized in the fall of 1895, by the Chicago "Times-Herald," was won by a German automobile owned by H. Muller & Co., of Decatur, Ill. In a later race, for which the Chicago paper offered \$5,000 worth of prizes, a greater variety of automobiles were entered. It was a fifty-four mile run, in which a number of foreign carriages were entered, and this product distanced all the American wagons that were entered, although part of the latter was forced to retire owing to accidents. It was a day of rain and snow and a very severe test of the vehicles entered.

In June, 1896, an automobile race was held in New York under the auspices of the "Cosmopolitan," and was won by the Duryea wagon. This last affair aroused interest all over the country, and everyone began inquiring into the business of self-propelled vehicles. Innumerable inventors are now at work on motors of various kinds, while companies are being formed to market what is considered the coming vehicle. All kinds of power is being used, each of which has its adherents, and this all important question can only be settled with time. That the sport of operating automobiles is bound to meet with favor cannot be denied by those who talk with enthusiastic automobilists. The new organization, the Automobile Club of America, is doing much to enlighten the public on the use of motor vehicles, and similar affairs will doubtless be organized throughout the country as the number of automobilists increase. Nothing presents a brighter future during the years to come than the sport and trade in motor vehicles.

### THE ARNOLD MAGNETIC CLUTCH.

In the design of the modern electric power plant it is frequently found desirable to arrange the generators in such a way that they may be readily connected or disconnected to the prime movers according to the exigencies of the service. This requirement of successful power station design was early realized by Mr. Bion J. Arnold, of Chicago, a pioneer in this field of engineering, who recognized at the same time the limitations of the ordinary friction clutch for this purpose. Accordingly,

in any desired amount. The energizing circuit is controlled by means of a switch placed at a convenient point, which is quite a decided advantage over the ordinary friction clutch. It thus becomes possible in throwing a generator in or out of service to control it entirely from the switchboard, where all the regulating devices and measuring instruments are within the reach of one attendant. These magnetic clutches also possess the advantages of neat appearance and compact design. Even in the larger sizes the amount of space occupied upon the shaft is not much more than twice the diameter of the shaft, and by using a flange forged solid on the end of the shaft, they can be made to occupy even less space when used as cut-off couplings. Owing to their having no projecting surface or parts to catch the air when in operation the windage resistance is negligible. The greatest advantage, however, of this form of clutch over others is the fact



FIG. 1.—THE LARGEST MAGNETIC CLUTCH IN THE WORLD.

some years ago, Mr. Arnold worked out a device which would meet modern requirements, and the result has been the development of the Arnold Magnetic Clutch, a number of which have already been built.

These clutches are in reality friction clutches, yet the friction between the contact surfaces is not due to mechanical pressure, but to magnetic traction. The working parts of the clutches are composed of metal having a high permeability so arranged as to become magnetized upon the passage of direct current through the coils with which they are provided. The two parts of the clutch can be attracted together in this way with a pressure far in excess of that obtained in mechanical clutches, and it is only a question of making the clutches large enough to enable them to transmit power

that it is self contained—the "action and reaction" being within the clutch itself, and consequently there is no resulting end thrust upon the shaft bearings and no additional friction load due to the operation of the clutch.

The illustration, Fig. 1, shows the largest magnetic clutch in the world. It is 100 inches in diameter, and is capable of transmitting 3,000 horse-power at 150 revolutions per minute. This clutch is one of three now in use connecting the engines and generators in the central station of the Imperial Electric Light, Heat & Power Company at St. Louis, a view of the equipment of which is shown in Fig. 2. The experience with this plant demonstrates that this form of clutch is applicable to the large size units now being installed for power station purposes, whereas the ordinary friction clutch

becomes especially unwieldy and unsightly after passing the 500 horse-power size.

There seems to be no reason why a clutch of the type shown in the illustration cannot be substituted for the fly-wheel of the engine in many cases, thus making the weight and cost of the engine unit, fitted with magnetic clutches, but little more than the weight and cost of the small installation fitted with ordinary mechanical couplings.

The current is carried to the clutch coils through contact rings upon the side of the clutch, and carbon brushes held by insulated brush holders. The electrical connections are simple and easily accessible for inspection.

The unique feature of this clutch is the small amount of current needed. It requires no more than would be used by four 16 candle

SOME INTERESTING FAULTS ON TELE-PHONE CIRCUITS.\*

BY "BUSYBACK."

Fault telephone and other circuits are due to a variety of causes, which, for our present purpose, may be put under the following heads: storms, electric light or power circuits, faulty construction and ordinary wear and tear.

Ordinary storm faults are caused by poles, wires or other parts of the outside circuit breaking down because of the excessive strains to which they are subjected, thus causing disconnection, short circuits and earth faults. Such faults as these are of frequent occurrence and of no special interest, so they need not concern us further at present.

ing damaged, but it will be useless till the piece of paper is changed.

For an ordinary pattern of telephone lightning arrester to fail in preventing a discharge through some of the coils of the instrument is a very common occurrence; most frequently it is the bell coils which suffer and are fused, though not always. In one case of a fault caused by lightning, which I distinctly remember, one of the coils of the double-pole receiver was fused, as it was impossible to change the disconnected receiver at once, the faulty coil was taken out of the circuit and the receiver left working on one coil. A few days later there was another thunderstorm, during which the remaining coil of the receiver was fused, and consequently the instrument was rendered useless till the

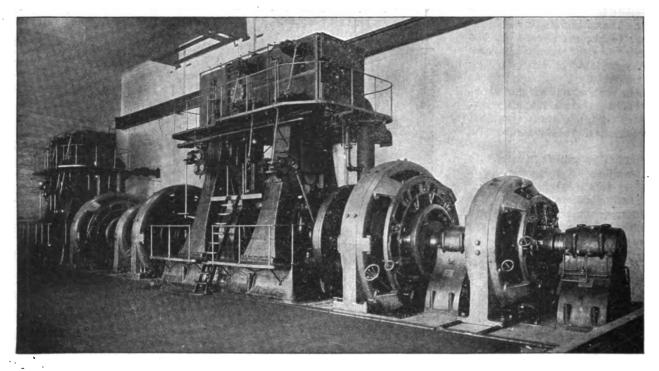


FIG. 2.—MAGNETIC CLUTCH CONNECTING ENGINE AND GENERATORS.

power incandescent lamps, and the loss in the clutch due to the continuous use of the electric current, while the clutch is in operation, amounts to only one-hundredth of one per cent. of the power transmitting capacity.

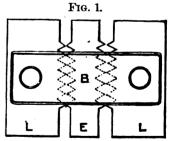
Although these clutches were developed for use in connection with the "Arnold System" of power station construction, their application is in no way limited to the demands of this system, and they have been adapted and adopted for other purposes. A number have been made to connect large synchronous motors to their load in such a way that they can be quickly disconnected in case of accident, and they have also been built for use upon line shafting. It would seem that they were particularly applicable to use in connection with gas engines, and there is no doubt an excellent field for them here. They might eliminate the flywheel problem of the gas engine in many cases, which of itself would be a distinct advantage. Indeed, there would seem to be no limit to their use wherever it is desired to transmit power from one shaft to another.

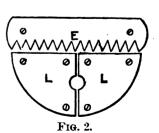
A scheme is under way for the development of the water power at Tetreauville, in Quebec province, on the Ottawa River and about two miles from the city of Ottawa, Can. The property along the shore of the river at the point has just been acquired by a syndicate of Ottawa capitalists which intends forming a company to be styled "The Chaudiere Electric Company."

Some of the most interesting faults which come under the first heading are those due to lightning discharges. It is not an unfrequent occurrence for the line wire to be used or damage done to the instruments by a flash of lightning; although all telephones which are intended for use on long distance circuits are provided with lightning arresters, lightning may disconnect or short-circuit them. One of the best forms of lightning arrester which has been fitted to telephone instruments has the disadvantage that while it prevents the instrument from being damaged by a lightning discharge, it is frequently found short-circuited after a storm. The construction of an arrester of this form will be understood from the accompanying sketch (Fig. 1), where L and L are two toothed plates in connection with the A and B wires of a loop circuit, E is a third toothed plate which is earth-connected, a piece of thin paper is laid over these and held in position by the strip of brass, B. When a lightning discharge takes place a spark frequently passes from the line plates, L and L, to the bar, B, and from this to the earth plate, E, making a small hole through the paper and carrying with it, in each case, a burr of metal which is sufficient to short-circuit and earth the instrument; this prevents the coils of the instrument from be-

\*From the "Electrical Review," London.

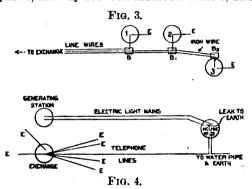
receiver had been changed. The cause of this fault was a badly made lightning arrester which did not admit of proper adjustment. An ordi-





nary pattern of lightning arrester, as fitted to a telephone, is made as follows:—L and L are two plates in connection with the lines, R is the toothed plate which is earth-connected. The three plates should be adjusted so that they are about one one-hundredth part of an inch apart.

One of the most interesting cases of damage by lightning which has come under my notice. occurred two or three years ago, and affected three separate circuits. The sketch of the positions of the affected circuits (Fig. 3), will make clear what follows. Circles 1, 2, and 3. represent three different houses with an ordinary telephone in each; B, B1, B2, represent small brick chambers with iron lids flush with the footpath, these chambers were joined together by earthenware pipes in which the wires (18 gauge copper, insulated with guttapercha and braided), leading from the exchange, about a mile away, were placed. Between chambers  $B_1$ ,  $B_2$ , there was one insulated wire and a length of No. 8 gauge galvanized iron wire with the ends left loose in each chamber, this wire was only to be used for the purpose of drawing other wires through the pipes. According to the inhabitants of the houses there was a very vivid flash of lightning, followed immediately by a loud peal of thunder; this flash of lightning fused the bell coil of No. 1 telephone, fused the induction coil secondary of No. 2, fused the wire and burnt through the gutta-percha covering of the wire to No. 3 telephone, midway between chambers 2 and 3, and



also fused the No. 8 galvanized iron wire which was lying in the pipe, volatilizing some of the zinc, which settled on the insulated wire for some distance. Instrument No. 3 was not damaged at all, and no damage was done in the exchange, beyond some of the lightning arrester points being burnt off and blackened by the discharge to earth.

The interesting point of this case of damage is that all the wire was underground, and the ends of the wires terminated in buildings, the wire could not therefore have been "struck," and the damage must have been caused by the return shock.

The points of toothed lightning arresters are frequently burnt off by discharges; other forms of arrester may have small pieces of metal torn off.

During a heavy thunderstorm in the neighborhood of a telephone exchange, nearly the whole of the line indicators fall simultaneously; if the storm is some distance away from the exchange, lines in the neighborhood of the storm pick up currents which are frequently strong enough to drop the indicators on these lines.

Electric light and power circuits nearly always cause a certain amount of disturbance on telephone circuits which are worked on the single wire system, now rapidly going out of date. When the light or power circuits are faulty, some curious troubles are experienced in the telephone exchanges, or on separate circuits which are near the affected circuits,

On one of my visits to a certain telephone exchange a short time ago, one of the operators complained that indicator No. 32 frequently fell and could not be replaced for some time, though no one was trying to call central from

the distant end: this most frequently occurred at stated times in an evening, and the current would sometimes be on the line for an hour or more, then all would be right again. This went on for several days, and as careful examination of the instrument and line did not show any defect, nothing was done. Shortly afterwards, the operator reported that the whole of the indicators, about 150, had fallen simultaneously several times. Inquiries at the house in which telephone No. 32 was situated revealed the fact that some electric light men were at work in the house; on cross-questioning them it was found that there was a leak to earth of 10 amperes when the lights in the billiard-room were turned on. The nearest telephone wires were 40 or 50 yards from the billiard-room, and these were carefully insulated. The cause of the trouble was this:-The telephone line was a single wire circuit with an earth return, the exchange was near the generating station, the current leaking to earth from the billiardroom must find its way back to the generating station, so a portion of it traveled along the water pipe, to which the telephone earth wire was soldered, along the earth wire, through the instrument, line wire and indicator at the exchange, to earth there, and so to the generating station.

When the leak to earth was stopped, no more trouble was experienced in the telephone exchange. The diagram (Fig. 4) will make the paths of the currents clear, and will also show why more than one indicator should sometimes drop. There must have been an earth in the generating station or near it, or the current would not have leaked back from the fault in house No. 32 to the station. The cause of other indicators dropping, as well as and at the same time as No. 32, was because one end of each of the indicator coils in the exchange was connected to the same earth wire, and their other ends, through spring jacks, to the various line wires. As the earth wire would have some resistance, the current would divide through all the paths to earth provided by the indicators, line wires, instruments, and earth wires at the various houses near the generating station.

#### WIRELESS TELEGRAPHY.

On the 18th, ult. Prof. Oliver Lodge delivered a lecture before the Glasgow Association, and in his discourse the general rise of electricity and the knowledge of electric oscillations were traced from the predictions of Clerk Maxwell in 1853 to the discovery by Hertz, and subsequently of the work of Branly, Righi, Bose, Popoff, and others. Prof. Lodge also referred to the work of Signor Marconi and Prof. Slaby in connection with the practical development of the wireless telegraph. To make the action of this more clear to his audience, Prof. Lodge likened the electrical discharge from the vertical wire to an impulse along the thong of a whip, whereby a great disturbance or whipcrack is communicated to the air in the one case, to the ether in the other; this is the sending of the signal. At a distant station a small fraction of the effect of this sudden disturbance is collected by a similar elevated wire connected at its lower end with a small tube of filings called a "coherer," introduced into an electric circuit with a battery and relay, so that when the electric stimulus arrives the filings cohere and convey the current, thus throwing over the tongue of the relay until they are tapped back and restored mechanically to their previously diconnected state. The operation of signaling was described, it being shown how the Morse signals could be transmitted and recorded. Farther on in his lecture Prof. Lodge explained that at the present time no attempt is made in practice to discriminate one receiving station from another. All within range, if sufficiently sensitive, can pick up the signal. There are methods, which the lecturer partly explained, whereby syntony can be obtainedthat is to say, where the sending and receiving stations can be tuned so as to respond to each other, but not to another station differently tuned. The attainment of tuning, however, at present restricts the range over which such telegraphy is possible—the radiating power of an attuned or syntonic instrument being less than the radiating power of an elevated wire just as it is more easy to obtain a loud sound out of a piece of string by using it as a whip-lash and cracking it, than by stretching it soundboard and plucking it. He remind He reminded his audience, in conclusion, that the sound analogy was simply used for the sake of explanation as the disturbances utilized in wireless telegraphy are etherial and not aerial. In this respect optical analogies were more correct, and there was a wonderful similarity between signaling by flashlights and wireless telegraphy.

#### A COMMENDATORY LETTER FROM THE CLEVELAND CHAMBER OF COM-MERCE.

THE CLEVELAND CHAMBER OF COMMERCE, CLEVELAND, O., Jan. 30, 1900. S To the Editor of Electricity.

SIR: We have read with interest your editorial of January 4, 1899, upon the reorganization of the consular service of the United States. Appreciating your efforts, we enclose for your consideration a copy of House bill 7097, introduced January 23 of this year by Hon. T. E. Burton of Ohio, and Senate bill 2661, introduced on the same day by Senator Lodge of Massachusetts. The two bills are identical.

A year ago the leading commercial organizations of the country appealed to Congress to effect a reorganization of the service. A special committee from the Chamber of Commerce of the State of New York and from the Cleveland Chamber of Commerce visited Washington, and urged the passage of the Adams bill then pending before the House. The bill, however, was not reached.

Since then the evidences of an increased desire on the part of commercial organizations and the public generally for an improvement of the consular service, have encouraged us to believe that Congress might be induced to pass a bill more immediately effective than the Adams bill, and embodying at once the reorganization of the service, which the Adams bill contemplated was to be arranged by a commission which should have two years in which to work. The two organizations mentioned, with the assistance of the National Business League of Chicago, and after consultation with officers of the State Department, and others of long experience in the consular service, have therefore perfected the enclosed bills. Many amendments were made by the gentlemen consulted, and the bills now before Congress represent the combined efforts of the commercial organizations mentioned and those especially qualified to judge of the requirements of the service.

Herewith we also enclose an explanatory statement of the bills, which will be of service.

We trust that you will feel disposed to use your influence to advocate the passage of these bills. Very truly yours,

H. A. GARFIELD, Chairman, Committee of Consular Reform.

#### LEGAL NOTES.

The initial proceedings in a suit in equity were taken February 1 in the United States Circuit Court of New York City by Thomas J. Montgomery against the General Carriage Company, organized in New Jersey. Mr. Montgomery alleges that he is entitled to \$1,000,000 of the carriage company's stock and \$300,000 n money which was promised him on May 3, 1899, when he transferred to Joseph H. Hoadley \$5,000,000 worth of the corporation's stock, rights for the territory within a radius of twenty-five miles from the City Hall here in the patent issued July 26, 1898, for improvements in electric self-propelling vehicles, to Louis Kriger. Mr. Montgomery asks the court to have his standing as a stockholder in the carriage company settled, and that the stock and money promised him for the patent rights which he turned over the Hoadley and on which he established the corporation in New Jersey be turned over to him.

William Boder was recently appointed receiver for the Miller Electrical Maintenance Company of Pittsburg, Pa. A bill in equity was filed by William McKinley, who states the company had a capital of \$30,000 and was made insolvent by mismanagement. Indebtedness, \$15,000; stock, \$10,000.

#### Proposals Invited.

The War Department, through the U.S. Engineer at New London, Conn., is inviting sealed proposals until March 2, for furnishing and installing an electric light plant at New London, Conn. Specifications and all necessary information will be furnished upon application to Major Smith S. Leach, New London, Conn.

Sealed proposals are being invited until February 24 for equipping the power house at the U. S. General Hospital at Presidio, Cal., with electrical machinery. Information will be furnished upon application to J. M. Marshall, deputy quartermaster general, San Francisco, Cal.

The Bureau of Supplies and Accounts of the Navy Department is inviting sealed proposals until February 13 for furnishing the New York Navy Yard with a quantity of electrical supplies. Blank proposals will be furnished upon application to the Navy Pay Office at New York, or to the Bureau at Washington.

#### Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended February 3:

Amsterdam, 7 cases, \$1,200; Antwerp, 14 cases, \$1,561; Argentine Republic, 238 cases; \$15,765; Brazil, 250 cases, \$9,143; Bremen, 1 case, \$50; British East Indies, 3 cases, \$605; British Guiana, 12 cases, \$200; British West ndies, 218 cases, \$11,851; Central America,

cases, \$1,319; Chili, 22 cases, \$1,082; China, 25 cases, \$523; Ecuador, 5 cases, \$34: Frankfort, 1 case, \$25; French West Indies, 2 cases, \$42; Glasgow, 43 cases, \$1,468; Havre, 280 cases, \$33,703; Japan, 10 cases, \$1,799; Liege, 2 cases, \$200; London, 26 cases, \$2,022; Marseilles, 35 \*cases. \$1,353; Mexico, 158 cases, \$6,944; Newfoundland, 6 cases, \$123; Nova Scotia, 2 cases, \$188; Peru, 20 cases, \$323; Porto Rico, 13 cases, \$449; Siam, 44 cases, \$240; Southampton, 52 cases, \$1,101; Trieste, 14 cases, \$358; United States Colombia, 13 cases, \$103; Venezuela, 29 cases, \$277,

#### PERSONAL MENTION.

Col. W. H. Eckert, president of the Knickerbocker Telephone Company of New York City, has been making a tour through the country inspecting switchboards.

Mr. George Bullock has lately been elected president of the Cincinnati Edison Electric Light Company, in place of Wm. Cromwell, who resigned.

Mr. George A. Miller, special agent of the Bell Telephone Company, who has been located at Niagara Falls, recently went to Lockport, N. Y., where he will labor in the interests of the Bell Company.

Mr. James F. Noonan has resigned his position as foreman of the drop forging department at the Pope Manufacturing Company's factory of Hartford, Conn., to take a more responsible position in the factory of the Columbia Electric Vehicle Company on Laurel street.

Mr. George W. Bright has been chosen president of the Columbus (Ohio) Electric Company.

Mr. Herbert J. Somerset, operating manager of the Electric Street Railway of Winnipeg, Manitoba, has received and accepted the offer as general manager of the Perth tramways in West Australia. As under engagement, he left last week for his new position.

Mr. F. N. Armour, of New York City, has severed his connection with the Siemens & Halske Electric Company of

Mr. Wareham A. Chase, of North Calais, Vt., has recently presented to the Vermont Historical Society a valuable relic of electrical appliances in the early days. It is an electrical motor which he invented and constructed about 1842. It is elliptical in shape, and although crude in construction, works to a charm even now. This is conceded to be the first known electrical motor invented.

#### COMMERCIAL PARAGRAPHS.

We are in receipt of a copy of the second edition of the Power Catalogue just issued by the Sprague Electric Company, 527 West 34th street, New York City. This handsomely gotten up little work-for so it may justly be called-contains some 72 pages of interesting and instructive reading matter and illustrations. As the title indicates the subject dealt with is "power" as derived from and applied with the well-known Lundell Motor. Among other things an advantage of this make of motor is referred to as follows: "The most notable and unique feature of the Lundell Motor, rendering it superior to all others now on the market and placing it in a class by itself, is the novel construction of the field magnets, whereby the single energizing coil magnetizes all of the pole pieces, and the strong protective shell for the windings of both field and armature completes, the magnetic circuit. Various types of these motors are made, two-pole, four-pole or six-pole, but all embody the one common characteristic of the single energizing coil." As this catalogue contains a large number of efficiency curves and tables of considerable value, it should be in the hands of all persons who contemplate installing electrical machinery.

The Ward Leonard Electric Company of Bronxville, N. Y., has just issued Catalogue No. 1900, descriptive of high grade rheostats and circuit breakers manufactured by this well known concern. The pamphlet, containing over sixty pages, is profusely and handsomely illustrated and in it is to be found many tables and much information of value. Any person interested in this subject can obtain a copy of the catalogue by addressing the Ward Leonard Electric Company as above.

#### INCORPORATIONS.

The Australia Manufacturing Company, Fayetteville, N. C. -to distill turpentine and acid from stumps and light wood by electrical process. Capital stock, \$150,000.

The Tillamook Electric Light Company, Tillamook, Ore. Capital stock, \$30,000. Incorporators: J. C. Havely, J. F. Watt and Charles C. Hays,

The River District Light, Heat & Power Company, New York City-to manufacture gas and electricity for sale in New York City. Capital stock, \$50,000. Directors: James Douglass, Cleveland, O.; H. Dodge, E. M. Johnson, William H. Yale and John Jay McKiltey, all of New York City.

The Algonouin Electric Brake Company, Portland, Me.-to manufacture and deal in electrical or mechanical brakes for all purposes. Capital stock, \$100,000. Officers; President, Chas. M. Drummond; treasurer, Joseph Drummond, Jr., both of Portland.

The Electro Chemical Light & Heat Company, Camden, N. J. Capital stock, \$1,000,000. Incorporators: F. C. Dowd, P. A. Dowd and J. L. Gethins.

The Dayton & Troy Electric Railway Company, Columbus O. Capital stock, \$30,000. Incorporators: J. M. Wilson, W. L. Caten, R. L. Worrell, L. G. Reynolds and Thomas B.

The International Electric Traction Company, New York

City-to acquire and control patents on electric railways and devices. Capital stock, \$3,000,000. Incorporators: G. F. Kissam, H. E. Heeler. G. L. Campbell, I. Phenegar, J. W. Lytle, all of New York City.

The Kansas City Electrical Wire Subway Company, Kansas City, Mo. Capital stock. \$20,000. Incorporators: John Moore, Frank Hagerman, A. R. Dillon and others.

The Puerto Principe Electric Company, Trenton, N. J.-to furnish electric lights to Puerto Principe. Capital stock, \$200,000. Incorporators: Israel L. Kelsev, Robert A. Belancourt, Winthrop C. Bushnell and Samuel Moorehouse.

The Electric Power Company, New York City-to manufacture storage batteries for electricity. Incorporators: Charles L. Case, John D. Elwell, Ulysses S. Grant, Harrison S. Martin, all of New York, and William M. Dugall, of East Orange, N. J.

The Consumers' Light, Heat & Ice Company, Newport News, Va.—to operate an electric light, heat and ice plant. Capital stock, \$100,000. W. C. Stuart is president.

The Sandusky, Monroeville, Bellevue & Norwalk Traction Company, Sandusky, O. Capital stock, \$600,000. Incorporators: Harry Hughes, William E. Guerin, Jr., Clark Ruse, William W. Graham and W. P. Ruders.

The New England Electric Company, Denver, Col. Capital stock, \$50,000. Incorporators: George P. Yates and William

#### ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FORRIGN PATENTS. at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N.W., Washington, D.C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR 4. MICHEL, Nos. 302 304 Broadway, New York City, N. Y., or 639 F street, N. W., Washington, D. C.

Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

#### LETTERS PATENT ISSUED JANUARY 80, 1900.

#### ELECTRIC RAILWAYS AND APPLIANCES.

642,156. Street-Car Fender. Louis H. Reppell and John P. Groff. Kansas City, Mo. Filed March 3, 1889.
642,216. Unit Multiple System of Control for Electric Railways. Frederick C. Esmond. New York City, assignor to the Esmond Electric Traction and Signaling Company, of West Virginia. Filed Sept. 27, 1898.
642,363. Trolley-Pole. Frank Pfent. Grenier, and Louis A. Moran, Grosse Point. Mich. Filed May 1, 1899.
642,553. Rail-Bond. Charles J. Mayer, Philadelphia, Pa., assignor to the Protected Rail Bond Company, same place, Filed Dec. 1, 1899.

ELECTRICAL MACHINERY AND APPARATUS,
642,123. Dynamo Electric Machine. Ernst W. G. C. Hoffmann. Charlottenburg, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed July 21, 1899.
642,159. Electric Switch. Ira Robbins. Camden, N. J., assignor to Timothy D. Kelly, Philadelphia, Pa. Filed May 36, 1899.
642,161. Alternating-Current Wattmeter. Karl O. F. Schrottke, Berlin, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed April 22, 1899.
642,364. Electric Motor. Edwin S. Pillsbury. St. Louis Machine Chicago, Machine Machine Chicago, Electric Motor. Edwin S. Pillsbury. St. Louis Machine Chicago, Machine Ch

1899.
 1892.
 1893.
 Electric Motor. Edwin S. Pillsbury, St. Louis, Mo. Filed Aug. 28, 1899.
 1892.
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 1894.
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#### SIGNALS AND SIGNALING APPARATUS.

SIGNALS AND SIGNALING APPARATUS,
642,102. Electric Signaling Device for Crossings, Oskar
Fuchs, Dresden, Germany, Filed Nov. I, 1886.
642,252. Automatic Electric Heat and Fire-Alarm System.
Richard P. Osgood and John D. Osgood, Methuen, Mass,
Filed Sept, 29, 1899.
642,362. Signal. Mathias Pfatischer, Philadelphia, Pa. Filed
Oct. 10, 1899.
642,369. Electric Signaling Apparatus.
Tamaqua, Pa. Filed Aug. 26, 1899.

#### MISCELLANEOUS.

642,167. Electric-Sparking Plug for Explosive-Engines. Frederick R. Simms, London, England. Filed July 7,

Frederick R. Simms, London, England. Filed July 7, 1899.
642,274. Magnetic Brake. Thorsten von Zweigbergk, Cleveland. Ohio. Filed April 29, 1899.
642,414. Manufacture of Electrical Resistances. Josef F. Bachman and Adolf Vogt. Vienna Austria-Hungary, assignors of twenty-one twenty-fifths of Josef Kirchner, Albert Konig, Carl Camilo Weiner, and Alexander Jorg, same place. Filed Oct. 8, 1897.
642,515. Armored Conduit. Jacob B. Boutillier, Boston. Mass., assignor of one half to W. B. Hunter, same place. Filed Nov. 1, 1809.
642,521. Junction-Box for Electrical Conductors. Edwin T. Greenfield, New York City. Filed Dec 18, 1899.
642,538. Armored Insulating Conduit. Andrew Thoma, Cambridge, Mass., assignor to Amanda M. Lougee, Boston, Mass. Filed July 29, 1899.



#### GENERAL NEWS.

What is Going On in the Electrical World.

#### LIGHTING.

Albion, Neb.—J. S. Armstrong representing a company has asked the city council to grant a franchise for an electric power, lighting and heating plant.

Alexandria, Va.—This city contemplates the enlargement and improvement of its electric light plant.

Anderson. Ind.—F. Sargeant, an electrical engineer of Chicago, has plans for enlarging and rebuilding the electric light plant of this city, in accordance with the orders of the council.

Appleton, Minn.—The electric light plant owned by M. Crickmore was recently destroyed by fire.

Appleton City, Mo.—The citizens of this place are agitating the question of erecting an electric light plant.

Atlanta Ga.-The Commercial Telephone & Telegraph Company, 603 Prudential Building, is open for bids on electric lighting outfits.

Bainbridge, O.—The citizens of this place have voted an additional bond of \$2,000 to finish their electric light plant

Bay City, Mich.—The committee on electric lights is considering the question of purchasing a Corlies engine for the electric light plant.

Broadalbin, N. Y.—John L. Moore is a representative of the New York capitalists who are interested in estabof the New York capitalists who are interested in establishing an electric light plant here. The success of the enterprise is practically assured. Negotiations are under way for the purchase of two or more of the water privileges located on the Kennyetto to furnish power for the proposed plant.

Carlyle, Ill.—The city council will arrange for plans and specifications for the electric light plant to be owned and operated by the municipality.

Cloquet, Minn.—At a meeting of the village council it was voted to granta permit to F. McCormick of Duluth, to erect an electric light plant here.

Corydon, Ia.—The citizens will vote on a proposition to install an electric light system. It is proposed to issue bonds for that purpose.

Flint, Mich.—The question of the municipal owner-ship of the electric lighting plant has been before the council lately. The directors of the company have left the matter of purchase price of the plant to three arbitraters, and to accept either cash or bonds, at the

arnuravers, and to accept either cash or bonds, at the option of the city.

Gaines, Mich.—The citizens of this place are contemplating having the village furnished with electric lights.

Kansas, Ill.—The question of putting in an electric light and power plant by the municipality of Kansas is being agitated.

Lowellville, O.—Sealed proposals will be received until 12 o'clock noon February 17, by the trustees of the electric light works of this village for the installation of a municipal lighting station. Copies of specifications may be had from the trustees or J. H. McWilliams, clerk.

Mansfield, O .- The electric light question is to be agitated at the spring election.

Matthews, Ind .- The citizens of this place are agitating the electric light question.

Middletown, Conn.—The municipal ownership of an electric light and gas plant, agitated some time ago, has by no means died out and will probably come up for action by the incoming city councils.

Monte Vists, Col.—The citizens of this place will take steps toward putting in a municipal electric light

Muskegon, Mich.-Propositions to bond this city for \$40,000 to build a municipal electric lighting plant, will be submitted to the voters in the spring.

Nashville, Tenn.—The council committee is in favor of municipal lighting, and will press the passage of the bill giving the city the right to issue sufficient bonds to carry out the plan.

Omkis, Minn.—The citizens of this place contemplate the issuance of bonds, for the purpose of erecting an electric light plant.

Philadelphia, Pa.—The new Chambers-Wylie Presbyterian Church to be built on Broad street is to have an electric light, heat and ventilating plant installed.

Reedsville, Pa.—The citizens of this place are agitating the question of erecting an electric light plant.

South Haven, Mich.—The village council has decided to call a special election to vote upon the proposition to bond the village for \$1,000 to enlarge the electric light plant.

Stewartstown, Pa.--The council has passed an ordinauce accepting the proposition of a company from Baltimore to build and equip an electric light and power plant.

Tams, Iowa.—Municipal ownership of the electric light plant is being talked of here.

Tarboro, N. C.—Bids for the erection of a new electric light plant have been advertised for.

Topeka, Kan.—W. J. Faulkner of Chicago proposes to establish a gas and electric light plant in Topeka.

ELECTRICITY.

Tullahoms, Tenn.—The electric light plant of this place is soon to be enlarged.

Union Point, Ga.-The Union Manufacturing Company of this place wants to buy a 250 to 300 light dynamo for 20 candle power incandescent lamps.

Wallingford, Conn.—This town contemplates the erection of a new electric light plant.

Winona, Miss.—The Blackston Mercantile Company of this place, wants bids on a 2,500 light machine for an electric lighting plant.

Yonkers, N. V.—The board of aldermen has authorized a committee to consult with experts relative to the cost and requirements necessary for the inauguration of an electric light plant to be constructed and operated by the city.

#### STREET RAILWAYS.

Ashland, O.—The old project of an electric railway from Savannah to this place, as promoted several years ago by Mannfield capitalists, has been revived with a considerable show of serious business. It is reported that Chicago capital is back of the enterprise, and the \$2,000 necessary to start the incorporation going has been provided.

Attleboro, Mass. The lease of the Attleboro branch of the New York. New Haven & Hartford Railroad will expire in March, and the understanding here is that the lessee will purchase the property outright, and then equip it with electricity. The branch connects the main division with the Wrentham branch to Bos-

Du Bois, Pa.—The electric railroad of this place is to be extended to nearby towns. The towns to be reached by the new line are Falls Creek, Reynoldsville, Du Bois, Pa.-Rathmel, Eleanors, Big Soldier Mines, Sykesville and

Evansville, Ind.—The projectors of the Evansville & Boonville Electric Line have secured the right of way Vanderburg County over the pike, which cost \$75,000.

Ft. Worth, Tex.-Col. J. T. Voss, president of the Ft. Worth, Tex.—Col. J. T. Voss, president of the Polytechnic Glenwood Street Railway Company, and President Van Ginkle of the Dallas Consolidated Electric Street Railway Company, have perfected an agreement for the building of an electric rapid transit railway between this city and Dallas, a distance of about 30 miles.

Garrettsville, O.—It is stated on good authority, that the Chagrin Falls & Eastern Electric Bailway Company having nearly completed its line to Middlefield will at once commence work on its extension to this place by way of Troy and Hiram.

Gloucester City, N. J.—The Camden, Gloucester & Woodbury Electric Bailway Company contemplates extending its trolley line from Woodbury to National Park on the Delaware in the spring. It is now being surveved.

Irvine, Ky.—S. L. Tudor and others are interested in an electric road to be built in this town and sub-

Jacksonville, Fla. -W. C. Nelson of Chicago and J. S. Turner of this city are interested in the Jacksonville Rapid Transit Company in the city and suburbs. The city authorities have been asked for a franchise.

Mishawaka, Ind.—The Mishawaka Elkhart Goshen Electric Railway and all its appurtenances have been bonded for \$1,000,000 for an extension to Michigan City and other points.

Nashville, Tenn.—The Nashville Street Railway Company, which represents the consolidation of the various electric lines in this city and suburbs, will expend about \$1,500,000 in improvements. A portion of the road may be rebuilt and extensions made.

North Greenfield, Wis.—The town council has granted a franchise to Stutley Henderson and others for an electric railway to be built between Hale's Corners and this place.

Baleigh, N.C.—T. L. Eberhardt and others are in-terested in the proposed street railroad line from this city to Milburnie.

Bochester, N. Y.—An electric trolley line from this city to Canandaigua is a possibility of the near future.

St. Clair, Mich.-J. R. Whiting of this city is presideut of a company that will construct a line of electric railway from Lenox to Rochester, a distance of 18 miles, connecting with the Michigan Central at both ends

Washington, N. J.—Mr. Thomas A. Edison has in-terested Philadelphia capitalists to connect Hacketts-town, Washington, Easton, Lake Hopatcong and other towns by trolley. The route has been surveyed to within a mile and a half of this place.

Willimantic, Conn.—A local electric road will be built here in the spring.

Wilmington. Del.—The contract for building the New Castle & Delaware City Electric Railway has been awarded to the Delaware Construction Company of this city. The road will be about nine miles long, and will connect the two towns.

Youngstown, O.—The city council has granted the Youngstown & Sharon Electric Railway Company, the right of way over the streets.

#### MANUFACTURING, ETC.

Logansport, Ind.—The Dohner Foundry Company of Cleveland, O., has moved to this city and will manufacture electric street cars on an extensive scale.

facture electric street cars on an extensive scale.

New York.—The Edison, Jr., E'ectric Light & Power Company will manufacture small portable batteries for the illumination of mines at a small cost. Thomas A. Etison, Jr., recently said that orders had been received for about \$40,000 in batteries.—The Sprague Electric Company has contracted to furnish and install complete for the Plymouth Cordage Company, two 75 kw. direct connected generating sets, each consisting of a 14 by 14 Ames engine and a 75 kw. split pele generator. An order for two 30 kw. generators to be used in the works of the Whitehall Portland Cement Company at Cementon, Pa., has also been received, and one of the Sound steamboat companies has ordered a Lundell generator to furnish 250 lights for one of its steamers. erator to furnish 250 lights for one of its steamers.

Springfield, Mass.—The Stanley Electric Manufac-uring Company has completed and shipped five large alternating current generators, and an inspect necessary alternating current generators, and a handsome dark blue marble switchboard to the Merchants' E'estric Light & Power Company at New Orleans, La., valued at \$40,000. A number of smaller boards are being made for concerns in New Hampshire, West Virginia, New Jersey and Alabama.

#### COMPANY MATTERS.

Bellaire, O—The electric plant and laboratories of the Bellaire Steel Works, owned by the National Steel Company, were recently destroyed by fire, entailing a loss of \$100,000.

Bridgeport, Conn.—The Bridgeport Electric Light Company has sold its plant to the United Illuminating Company of New Haven for \$52,000.

Cincinnati, O -The Bullock Electric Manufacturing Company has recently turned out a large piece of machinery for the Oakland Transit Company, Oakland Cal. The machine is a 550 volt, 800 kilowatt engine type generator, developing 1,200 horse power. The armature alone weighs 23 tons. Three freight cars were required to transport the machine.

Dunkirk, N. Y.—The electric power house of the Dunkirk & Fredonia Street Car Company was recently destroyed by fire, together with all the cars.

Franklin, Pa.—The Franklin Electric Company wil give the smoke preventive invention of A. Pillatt, of London. a month's trial.

New Haven, Conn.-The Fair Haven & Westville Railroad Company has contracted with the Allis Works of Milwaukee, Wis., for two engines of 750 horre power each to be delivered next fall. Four new boilers will be contracted for later.

Owosso, Mich.—The Owosso & Corunna Electric Railroad passed into new hands February 5, the own-ers now being Eastern parties.

Bye, N. H.—The Boston & Maine Railroad Company has purchased a lot of land from E. C. Jenness, upon which there will be a building erected to be used for electrical purposes in connection with the new electrical railroad.

San Jose, Cal.—The works of the Electric Improvement Company were recently destroyed by fire. loss is estimated at \$100,000; insurance, \$50,000.

Trenton, N. J.—Another enterprise of John A. Roebling's Sons Company is the Woven Steel Hose & Cable Company incorporated recently in this city. The company is capitalized at \$100,000, and will manufacture sheathing for wire, cables and electrical conductors.

Conn.—It is understood that the Waterbury waterbury. Conn.—It is understood that the Connecticut Lighting & Power Company has purchased what is known as the old Jones property, valued at \$3 000. There are rumors to the effect that the land will be utilized for the construction thereon of a power house about the time the line to this city is ready for operation.

#### **AUTOMOBILES**

Buffalo, N. Y.—It is reported that Charles B. Hunt-ley of the Buffalo General Electric Company, and other well-known business men of this city, are organizing a company for the establishment of a new automobile cab service. They have ordered from the Woods Motor Vehicle Company 15 cabs, which will be put into service as soon as they arrive.

Denver, Col.—A great deal of interest is centered in the experiment of a line of automobile 'buses on Eighth avenue. A company has been formed to operate the system, and will place an order for fif.een of the latest type of double deck automobile 'buses, which will be operated by electricity, and have a seating capacity each of twenty people. The promoters expect to have the system running in April.

New Haven, Conn.—Thomas B Lasher purchased an electric vehicle from the Riker Electric Vehicle Company's booth at the Automobile Show held in New York. Mr. Lasher expects to be able to introduce his system in the near future.

New York.—All of the fifty motor vehicles on exhibition at Madison Square Garden were sold at fincy prices. O ders are booked for the factory capacity far prices. O'ders are booked for the factory capacity is into the spring. In fact the metropolis has taken such an interest in automobiles that the manufacturers have announced their intention of holding another exhibition in the Garden. It will be for "autos" only and will be opened next October.



# THE TELEPHONE WORLD.

#### The Independent Companies of Michigan Combine.

A combination of all the independent telephone companies operating in Michigan was effected recently at a meeting held at Grand Rapids. Every company in the State was represented except South Haven and Saginaw, both of which, however, had, previous to the meeting, signified their intention of joining with the other companies.

The new combine will have control of over 21,000 'phones

n towns and cities in Michigan, and it is claimed will own more miles of toll lines in the territory they cover than any other company.

Outside of Detroit it is claimed the independents are considerably stronger than the Bell Company, are accessible to more towns and used by a greater number of people. While definite plans regarding the management of the new system are not matured, it is the general purpose of the organizers to leave the details of the management of local offices to the officers of the company now employed, and only to govern from the central office the larger business deals. The chief purpose of the combination is to offset the effect of the recent purchase of the Detroit company, and to strengthen the hands of the independent companies all over the State in their fight against the old company. In addition it is expected that with the entire system in Michigan under one executive head the various lines will be brought into closer touch, and better service for the company's patrons will result. The companies represented at the meeting were:

Citizens' Telephone Company, Muskegon, C. T. Hills and William Robinson.

Saranac Company, Henry Frace and S. M. Crawford.

Lansing Company, B. F. Johnson and Thomas Gunnison. Union Telephone Company, Gratiot and Isabella counties, C. F. Brown and C. O. Trast, Alma, and G. W. Robinson,

Vestaburg. Traverse City Company, George Gane and C. W. Wheelock. Oceana Company, E. F. Fuller and S. P. Hyde

Howard City Company, C. T. Sing and W. F. Nagler.

Adrian Company, ex-Mayor W. O. Hunt.

Kibble Company, J. H. Tripp.

Kalamazoo Company, C. S. Seitz and H. H. Everhart, Dowagiac Company, W. F. Hedden.

St. John's Company, J. T. Milman and J. H. Fildew. Cassopolis Company, William Jones

Peninsular Company of Jackson, C. K. Perrine.

Eaton County Company, W. C. Osborne. Kalkaska Company, C. W. Swaverley and A. J. Hostetler,

Shipshewana, Ind. Owosso Company, C. W. Gale, R. W. Crawford and T.

Kincaid.

Grand Haven Company, J. W. O'Brien. McBride's Company, C. H. Laflamboy.

Benton Harbor, J. R. Pierce.

Lake Odessa, George A. Weed. Sunfield Company, J. H. Palmer.

Reed City, C. F. Marshall.

Grand Rapids Citizens' Company, C. F. Rood, Judge C. E. Perkins, E. B. Fisher and J. B. Ware.

The stockholders of the Cumberland Telephone & Teleraph Company met in Louisville, Ky., on the 25th ult., to ratify the consolidation with the Ohio Valley Telephone Company, of Louisville, under the name of the former company. The capital stock will be \$10,000,000 and the shares will be \$100 each. Stockholders in the Ohio Valley Company will receive equal shares in the new company. The consolidation was decided on at a meeting of the directors at Hopkinsville, where will be the headquarters of the consolidated company. The Cumberland will control ten thousand miles of wire, eleven thousand toll stations and territory from Louisville to New Orleans. The two companies are the largest in the South, and have gradually been securing control of all the rival lines. The Ohio Valley Company controlled the systems in Louisville and New Albany, but it was bought out and absorbed last spring. J. E. Caldwell, of Nashville, is at the head of the consolidated companies. Of the \$10,000,000 capital \$2,500,000 is paid up.

The Kinloch Telephone Company stockholders held their annual election of directors recently in St. Louis. Mo. All the directors were re-elected for another term, as follows: Samuel M. Kennard, William F. Nolker, William D. Orthwein, Breckenridge Jones, Hopkins J. Hanford, C. K. Dickson Walsh, Adolphus Busch, Ellis Wainwright, Julius S. Walsh, Charles H. Turner, C. Marquard Forster, August Gehner and George J. Kobusch. The directors will meet within two weeks to elect officers. The company now has over 6,000 subscribers, and the largest independent switchboard in the world in their

The plant of the Missouri & Kansas Telephone Company operating in Kansas City, Mo., will be improved and the sys tem extended during the present year. It is proposed to expend in the neighborhood of \$500,000.

#### The Ericsson Telephone Company's Series.

The Ericsson Telephone Company, 296 Broadway, New York, is getting out a series of interesting pamphlets containing telephone information of value. In Vol. I, Part 2, which is before us, there appears among other things an interesting review of the telephone situation in Sweden which

is well worth reproducing. The article says:
"The first telephones were installed in Gothenburg and
Stockholm about 1880 by the Bell Company. The rates were high, and a rival company appeared in 1883 in the form of a co-operative society. Each member was to be responsible for the cost of his instrument and proportion of operating expenses, and pay yearly about \$20. Sweden was soon full of these companies. We might say that this useful assistant to everyday life invaded the seclusion and quietude of villages and towns heretofore not found in the geography.

"This new company in Stockholm and Gothenburg began to compete for business at lower rates than the Bell. It was an experiment that was ridiculed by the old company, and the ruin of the competing societies was predicted. The contrary was the effect, and at this writing the Bell Company has been driven from the field. This General Company, in 1884, began to extend its field, and began the construction of trunk lines. It proved a success. The Government became alarmed lest its telegraph system should suffer. After the matter had been discussed to a standstill by Parliament, and the King himself asked to decide, the Government decreed that the State, post and telegraph department should have exclusive right to erect intertown wires except within a radius of 43½ miles about Stockholm. In this latter territory the General Telephone Company was allowed to construct where it wished. The surface about Stockholm is the best telephoned part of the globe. To own the trunk lines and not those in the large cities appeared to the Government officials as a short-sighted policy. The local exchanges then began to be purchased by the State. The Bell in Gothenburg was the first company to be acquired by the Government. In making this and other purchases the price was not arrived at by any computation of earnings or value of installation, but the State made a bid and the companies throughout the Kingdom, with the exception of that in Stockholm, were only too anxious to surrender to the Government, shorn as they were of their existing right to construct trunk lines.
"The Government, having entered the field about 18%, did

its work well. All circuits were metallic, and wires, wherever possible, were put underground. Since 1894 the wires in Stockholm have all been underground. The General Company of Stockholm could not be intimidated into disposing of its lines, and, in consequence, at the capital we find now the only competition in the kingdom. The subscribers to the State system have many advantages over the subscribers of the General or competing company, but its figures are dearer (\$12.50) than those of its competitor (\$11.75). It may be said that the telephone business is now practically in the hands of the State, without competition, except at Stockholm. The success of low rates has been more strange on account of the frequent necessity of employing submerged cables, on account of the lay of territory to be covered. I must mention that most of the ships entering the harbor are connected with telephonic communication while lying at their wharves.'

According to the "News" of Saginaw, Mich., an officer of the Valley Telephone Company recently received the following telegram from Mr. H. A. Everett, president of the Cuyaoga Telephone Company of Cleveland and of the United States Telephone Company: "In view of the circulation of a report that the United States Telephone Company and other independent telephone interests which are identified with it are either now, or hereafter, to be included in the transfer of the Detroit Telephone Company to the Bell Company in Michigan or elsewhere, you are hereby authorized and requested to say for me that such statements are absolutely and wholly false, and calculated, and, I believe, intended to influence other independent telephone people. You are further authorized and requested to say for me that the report that I was present at, assisted in or know anything of the negotiations for the sale of a controlling interest in the stock of the Detroit and New State Telephone companies, is a lie, made of whole cloth. The United States Telephone Company and allied interests have placed orders for a very large amount of material to be used by them during the present year, in completing their systems in Ohio, and making connections with like properties in adjacent States, and this work is to-day being vigorously prosecuted and will be until it has been completed."

A plan is being considered to organize a local telephone company and put in a system in Chehalis, Wash. The town has about sixty telephones in use, but the plant is owned by the Sunset Company. It is believed that a local company could lessen the tolls so that the service would be much larger and of greater benefit to the public. The council may be asked to grant a franchise at an early day,

#### A Meter for Telephones.

A dispatch from Paris, France, to the N. Y. "Herald" states that for a long time the French Government has been studying the question of cheapening the telephone service. and now under the regime of M. Mougeot, under secretary, it is thought probable that some satisfactory solution will be arrived at.

The whole thing pivots on the use of a compteur telephonique, which is nothing more than an attachment used like a gas meter, and which is connected with each telephone instrument installed in house or office, and measures exactly the amount of electricity used.

Each conversation is supposed to last exactly three minutes. The compteur which begins work when communication is established between two persons, is so delicate that the voices of those conversing must be distinct before the machine

When the three minutes are up the compteur breaks off the communication, which, however, may be continued by once more pressing a buttom.

Each month a man comes around to the house or office, just as does a gas company employe, and verifies the consumption of electricity at the rate of fifteen centimes (three cents) for each conversation of three minutes.

The advantage claimed is that each subscriber to the telephone sees before him the exact sum which he is to pay and thus all disputes are avoided, and so the compteur replaces the fixed tariff.

Every one has to pay according to the actual use to which the instrument is put. This will, of course, be a loss to persons who use the telephone every minute of the day, but, on the other hand, it is easy to see its convenience and economy to persons who only use the telephone moderately.

It is supposed that this system will increase the number of subscribers, and that the telephone will be much more in use than ever if this new system is inaugurated in France. the tariff will be 40f. (\$8) a year subscription fee, and the price of the telephone apparatus installed in each house 120f. The last named sum may be paid in installments of 60f. (\$12), 40f. (\$8) and 20f. (\$4). Then there is added to this price the regulation 15c. per three minutes' conversation, as shown by the compteur, so that an outlay of 160f. (\$32) for the first year, plus the actual work done, represents the cost of telephoning from one's own house in Paris, should the new system come into vogue.

But to offset all these advantages, which look so tempting on paper, there is a serious difficulty accompanying cheap telephoning, which means increased subscribers.

As the case now stands one has to wait quite long enough to get communication, owing to the immense amount of work exacted of each telephone girl at the central and branch telephone offices, so what would be the effect of an increased number of subscribers ?

However, if this difficulty be overcome, which is quite possible, then the proposed new system will be a distinct advance and the telephone system worthy of the opening of a new century.

It is rumored that the absorption of the American Bell Telephone Company by the American Telephone & Telegraph Company, official preliminary announcement of which was made on December 2, 1899, has been postponed until autumn. Officials of the Bell Telephone Company, when questioned with regard to this rumor, refused to deny or affirm it. The reason assigned for the delay in carrying out the plan is that the passing of necessary legislation, particularly at Albany, will require a longer time than anticipated, and that also it has been deemed best to allow the matter to rest during the present session of the Massachu setts Legislature.

At a recent meeting of the directors of the Goshen Tele phone Co., of Goshen, Ind., arrangements were completed to merge the local company with the independent lines of the county at a capitalization of \$100,000; the valuation of the local company being placed at \$30,000, and the Elkhart Company at \$35,000. The Hon. Charles W. Miller is the president of the new company. The combination takes in all the independent toll lines of the county, and arranges for the pur-chase of a half interest of the independent toll line from Goshen to Lagrange, which has been owned by the Lagrange Independent Company.

The Central New York Telephone & Telegraph Company is said to have purchased of the Western Union Telegraph Company its poles from Oneida to Rome via the turnpike. The Western Union Company removed the wires some time ago to their main line beside the New York Central Railroad tracks. Preparations are being made by the telephone company to rewire these poles and establish a metallic circuit be tween Oneida and Rome.

The Home Telephone Company of Richmond, Ind., has decided to increase its capital stock from \$100,000 to \$150,000 to allow for the construction of more toll lines.



### ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electricity from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv.. convertible; com., common; deb., debentures; extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

# STOCKS.

PASSE	NG	ier r	AILW	AYS.	<del></del> -		PASSE	NG	ER R	AILW	AYS.	,	,
		Capital		Bate and Date of					Capital	Stock.	Pate and Date of		
HANG.	Par	Authorz'd	Issued.	dast Div.	Bid.	Asked.	NAME.	Par	Authorz'd	Issued.	Bate and Date of Last Div.	Bid.	Anke
Albany, N YFeb 5. United Traction (Consolidation of the Albany and	100	2,000,000	\$1,750,000	  1½ % Q., Nov. '28.	129	130	Hartford Conn.—Feb 5 : Hartford Street Ry. Co	100 100	\$4,000,000 1,000,000	\$200,000 247,000	8 % S., Oct., '98.	145	:
Troy City Bailway.)							Holyoke Mass.—Feb 5. Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June, '98,	200	207
Allentown Pa Feb 5 :			1 500 000	l	1		Hoboken, N. J.—Feb 5	ļ				1	
Allentown & Lebigh Val. Trac Co BPidgeport, Conn-Feb 5	1	4,000,000	1,500,000	•••••		15	North Hudson Co. (N. J.) Ry. Co	26	1,250,000	1,000,000	8 <b>%, 1892</b> .	150	-
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug., '98.	105	•••	Indianapolis, Ind-Feb 5. Citisens' Passenger Ry		5,000,000	5,000,000	•••••	28	80
Baltimore, Md.—Feb 5 a United Rallways & & lec. Cocom	50	24,000,000	18,000,000	••••••	161/	17	Lancaster, Pa.—Feb 5 Pennsylvania Traction Co	100	10,000,000				_
Boston, Mass Feb 5			. 001 005	1 8 0 70 15 100			Lancaster & Col. Electric By West End Street Railway			87,500	**************	::	=
New England Street By	100 100 50	2,000,000 10,000,000	4,000,000 2,000,000	1 % Q., Jan.15, '97 6 % S., A. & O. 8 % % S., Oct., '98. 4 % S., Jan. 2, '99.	15 85	16 87 984	Louisville, Ky.—Feb 5: Louisville Ry	100	4,000,000	8,500,000 2,500,000	l¼ %., April '98, 2¼ % 8., Oct. 1, '98	1	70 111
West End Street By. Co\$ % pfd. Boston Elevated B. R		6,400,000 10,000,000	6,400,000	21/4 % Aug. 98,	112 1(2	114 104	Minneapolis, MinnFeb 5					İ	
Brooklyn N. Y Eeb 5 Brooklyn City My	100	2,000,000	1,928,400	•••••	:37	239	Twin City Rapid Transitcom Twin City Rapid Transit?% pfd.	100	17,000,000 8,000,000	15,010.000 1,712,200	134 %, Oct., '98.	63 <sup>3</sup> ,	187
Brooklyn Rap. Transit Co., ir certf  aBrooklyn Heights Railroad  *dBrooklyn City RRguar	1	200,000	20,000,000 200,000		753/8 107 288	751/2 109 241	Montreal, Canada. – Feb 5: Montreal Street Ry. Co	50		4,000,000	8 % S. M. & N.	27.2	263
eBrooklyn, Queens Co. & Sub. RR. Coney Island & Brooklyn RR	100	2,000,000	2,000,000 1,884.200	21 X Nov., '98.	3 15	::	Memphis TennFeb 5:	100	6,000.000	6,000,000	1% % S., J. & J.	1627/	18
Kings County Elevated Kings County Traction Co	100		4,750,000 4,500,000	1 % July 26, '97	::		Memphis Street Railway Co	100	500,000	<b>500,00</b> 0	*******************	25	-
Naccau Electric Hallroadpfd. /Atlantic Avenue Railroad	50		2,000,000	• • • • • • • • • • • • • • • • • • • •	76	77	New Haven, Conn.—Feb 5: Fair Haven & Westville RR	25	2,000,000	2 000 000	R & St. Clamb 100	46	
gBrooklyn, B. & W. E. Railroad	••••	1,000,000	1,000,000	*********	••	••	New Haven & Centerville	100		1,000,000	8 % S., Sept. '98, 2½ % A., July '96.		•••
Buffalo N. Y.—Feb 5: Buffalo & Niagara Falls Elec. Ry	100 100		1,250,000	1 % Q. Dec., '98.	74	75	WINCHESIEF AVENUE RR	25	1,000,000	600,000	• • • • • • • • • • •	47	=
Buffalo Raliway Co	100	6,000,000	0,810,000	17, 4, 166, 16.	101	103	New Orleans, La.—Feb 5; Canal & Claiborne RR. Co	40	240.000	240,000	4 % 8., July, '98.		
Columbus Street Railroad Columbus Street Railroad, pfd	100 100		8,000,000 1,500,000	l % Q., Feb., '99.	20	22	New Orleans Traction Co.	100 100	1,200,000	1,200,000	4 % 8., July, '98. 1½ % Q., Oct., 98.	148 % 29 %	
Charleston, S. CFeb 5		_,,	_,000,000				Crescent City BB	100	2,000,000	2,000,000	8 % S., Jan., '99.	101 205	102
Charleston City Ry. Co Enterprise City RR. Co	50 95	100,000 1,000,000	100,000 350,000	8 % 8.			Orleans Railroad	50	2,000,000 500,000	2,000,000 185,000	8 % S., Jan., '99. 4 % S., Jan., '99. 1½ %., June, '94. 1¼ %. Oct., '98.	::.	52
Chicago, III.—Feb 5		, ,	i			••	New York—Feb 5:	50	1,000,000			56%	67
Dhicago City By. Co	100 100	12,000,000 10,828,800	12,000,000 10,828,800	8 % Q., Dec. 81, '98.	275	280	Central Crosstown BR	100	600,000	600,000	2½ % Q. 2 % Q., Oct., '98. 1½ % Q., Nov., 98. 1½ % Q., Jan., '99. ½ % A., July, '98. 2½ % Q.	275	280
Metropolitan West Side Elev. By					173/4 24	J8 25	Metropolitan Street Pr. C.	100	1,200,000	1,200,000	1½ % Q., Nov., 98.	125	150
Morth Chicago Street RR	100	15,000,000	2,500,000	8 % Q., Jan., 99.	76 236	78 237	Broadway & Seventh Ave	100	900,000	900,000	1%, % Q., Jan., 799. 14 % A., July, '98.	35	153
North Chicago City RR	100	500,000	249,900	••••	••	•••	gCen.Park,N.&E. Rivers RR. guar hEighth Avenue RR.	100	1,800,000	1,800,000	27 X Q.	195	240
West Chicago St. RR. Co	100	20,000,000	18,189,000	1% % Q., Feb. 99.	1101/4	ıii	142d St. & Grand St. Ferry RR.guar	1 200	750,000	748,000	4% % Q.	395	400
Whicago Passenger Ryguar.	100	2,000,000	2,000,000	5 × 8.	::	85	kSixth Avenue RRguar.	100 100	800,000 <b>2,</b> 000,000	2 000 000	*********	. 9 <b>5</b> 209	211
Cincinnati, Ohio.—Feb 5:							Ninth Avenue RR	100 100	600,000 2,500,000	600,000 1,862,000	4½ % Q. 2 % Q., Jan., '99. \$1.75 p. sh. Feb. 99.	898 200	420 205
Incinnati Inc. Plane Bycom. Incinnati Inc. Plane Bypfd.	50	1,000,000	575,000			•••	m42d St. Manhaty'le & Gt Nich	100	12,000,000 2,500,000	10,000,000 2,500,000	\$1.75 p. sh. Feb. 99.	100¼ 75	100 82
Encinnati, Newport & Cov. St. Ry. Dincinnati Street Ry. Co	50 100	150,000 4,000,000	150,000 <b>8,500,000</b>	% % Feb., '99. 2% % Feb., '98. 1% % Q., Jan., '98. 1% % Q.,Jan., '98.	89	89	Omon (Huden-perry) Ry	100	2,000,000	2,000,000	•••••••	190	200
Mt. Adams & Eden Park Inc. Ry.	50 50	18,000,000 2,500,000	14,000,000 2,200,000	1½ % Q., Jan., '98,	120%	121	Newark N JFeb 5: Consolidated Traction Co. of N. J	100	15,000,000	15 000 000			
leveland, OhioFeb 5							North Jersey Street Railway Co. United Electric Co. of New Jersey	100	6,000,000	6,000,000	***************************	61 80	81
kron, Bed. & Olev. Elec. Ry	100 100	1,000,000	1,000,000	% % Jan., '98 8-5 % Jan. '99.	48 9914	50 100	Pittsburg, Pa.—Feb 5:	100	504,000	501,000	11% <b>% A</b> .	233%	27
leveland Electric By	100	12,000,000	12,000,000	3-5 % Jan. '99. % % Q., Oct., '98.	90	91	Allegheny Traction Co	50	500,000	500,000	2 %, Jan., '95.	54	55
Ostroit, Mich. – Feb 5 Detroit Uttisens' Street Ry	100	• • • • • • • • • • • • • • • • • • • •	1,250,000	••••	1001		pCentral Traction Copfd.	50	15,000,000	15.000.000	3 %, Nov. '98.	28 61	. 8 62
A. Wayne & Belle Isle Ry	100	2,000,000	1,200,000	*********	1001/4 175	::.	QUITEEns Traction Co	50 50	1,500,000 8,000,000	1900,000 18.000,000	l ½ % Nov. 7, '98. 8 % A.	6914 69	70 70
lapid Řailway Co	ارز:	250,000 1,000,000	250,000 1,000,000	**********	90	100	rDuquesne Traction CosPitisburg Traction Co	50 50					
Dayton :OFeb 5:	100	250,000	200,000	**********	100	110	Pgh., Allegheny & Man. Trac. Co	25 50	1,400,000 8,000,000	1,400,000 12,994 889	2 % %, July, '98.	28	28
Hty Railway Co	100	1,500,000	1,470,600 600,000	1% % Q.	126%		rDuqueene Traction Co	26 50	8,000,000 1,500,000	8,000,000 1,500,000	5 A. A. 5 X. Nov. 7, '98. 2 X. July, '98. 2 X. Aug., '95. 1 X. Oct. '98. 5 X A., June 80, 98.	40	42
cople's Street Railway	100	000,000	600,000	1% % Q.	160	115	United Traction Co	50	17,000,000	17.000 000	J. & J.	i2	16

\*Unlisted. † Ex div.
a The United Railways & Electric Company comprises in its organization the Baltimore Consol dated Railways & Electric Company comprises in its organization the Baltimore Consol dated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co of Baltimore. The pref stock of U R & Eee Co has been issued in the form of income bonds. b Leased to B iston E evated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
e Stock owned by Kings County Traction Company; road operated by Brooklyn Hist. Co.
f Stock owned by Kings County Traction Company; road leaved to Nassau Electric RR.
g Owned by Atiantic Ave RR and leased to Nassau system.
h \$30 per share on outstanding capital paid as rental by lessee - West Chicago St. RR. Co.;
\$250 100 of stock owned by North Chicago Street Railroad Company.
i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
j \$35 yer an aum paid on outstanding capital as rental by lessee - North Chicago Street Railroad Company; \$225,100 of stock owned by Chicago West Division Railway Company; 5% on \$1,000,000 stock guaranted by West Chicago Street Railway Company, lessee.
Cincinnati St. Railway purchased the Mt. A. & Kden Park road, assuming its bonds

\*\*Unlisted. † Full paid. | Outstanding. † Ex-div.
a Leased to New Orleans Traction Company at 6 % on stock.
b Lessed to New Orleans Traction Company at 8 % on stock.
b Lessed to New Orleans Traction Company at 8 % on stock.
c Leased to Central Orosstown Railroad at 8 % on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
c Leased to Edstreet Ry for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway
g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1. 1897; thereaft r 9 %.
h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.
i Leased to Metropolitan Street Railway for 18 % on stock
j Leased to Metropolitan Street Railway for 18 % on capital stock.
d Leased to Metropolitan Street Railway for 18 % on capital stock.
n Dividends of 13 % yearly guaranteed by Consolidated Traction Company.
o Controls by lease. The Alleg'ny, Cent., Otitzens' Duquesne, Fort Pitt & Pits h Traction.
p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
s Leased to Consolidated Traction Company for 8 % on capital stock.

Leased to Consolidated Traction Company for 8 % on capital stock.

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# PASSENGER RAILWAYS.

#### TELEPHONE AND TELEGRAPH COS

/ ACCE	_						" IEEEI IIOIEE	~				_	
NAME.	Par	Capital Authors'd		Bate and Date of Last Div.	Eld.	Asked.	NAME.	Par	Capital Authorz'd		Bate and Date of Last Div.	Bid.	Aske
New Bedford Mass-Feb 5 Union Street Ballway Co Northampton, Mass-Feb 5	100	\$850,000	\$850,000	2 %, Feb. 98.	160	165	Boston, Mass.— Feb 5. American Bell Telephone Co Erie Telegraph & Telephone Co New England Telephone Co	100	50,000,000	28,650,000	1 % Q., Jan '99. 1 % Q., Feb. 20, '99 81.50 p. sh. Feb '99	834 9 104 185	835 1043 186
Northampton Street RvOmaha, Neb Feb 5;	100	800,000	225,000	4 % A., June '98.	170	178	New York.—Feb 5 American Telegraph & Cable Co					1	
Omaha Street Ry Paterson, N. J Feb 5	100	5,000,000	5,000,000	8 % A. and N.	55	65	*Central & South Am. Teleg. Oo *Commercial Oable Oo Franklin Teleg. Co2½ % guar.	100 100 100	14,000,000 6,500,000 10,000,000	6,500,000 10,000,000	1% % Q. 1% % Q.	1903	9 198
Providence, R. L. Feb 5	100	1,250,000	1,250,000	******************	54		Erie Telegraph & Telephone Co	100	5,000,000 5,000,000	4,800,000	1% % Q. 1% % S. 1 % Q., Feb., '99. 1% % Q. 1% % Q.	1183	6 119
Inited Traction & Electric Co	100	8,000.000	8,000,000	3/4 %, Oct '98	108	1081/4	*International Ocean Tel Co.guar 6% Mexican Telephone Co *New York & New Jersey Tel. Co	100	2,000,000 5,000,000	8,728,000	1% % Q. 2% % Q., Jan., '99. 2 % 8.	115 3 187	117 81/4 188
Philadelphia .— Feb 5 Tairmount Park Trans. Co §51 pd. Hestonville, Man. & Fairmount	50 50	2,000,000 1,966,100	1,770,000 [1,966,100	2 %, Dec. '97. 2% %, July 15, '98.	28 47	24 48	*Pacific & Atlantic Telegguar. 4 % *Postal Telegraph Cable Co *Sout'n & Atlantic Telg. Co.guar. 5 %	O.E.	2,000,000 15,000,000 950,000	15,000,000	2 % 8. 1 % Q. 2% % 8. 8 % 8., Jan., '99.	78	82 116
Hest'nvl'e, Man. & Fairm't6 % pfd. aFairmount Pk. & Had. Pass. Ry. Jnion Traction Co \$12½ pd	50 50 50	588,900 800,000 80,000,000	29,980,450	2½ %, July 15, '98. 3 % 8—July, '98. 3 % Feb. 1, '98.	75 75 81/8	76 76 351/4	†Commercial Union Telegraph Co Western Union Telegraph Co †Div. guar. by Postal Teleg. Co.	25	500,000	500,000 97,870,000	8 % 8., Jan., '99. 1% %, Q, Jan. '99.	115 86½	1
dCitizens' Passenger RyeFrankford & Southwark Pas. B	50 50 50	500,000	8,297,920 †192,500  11,875,000	\$8 share Q. \$14 sha'e A—Apr.98	345 45	451	Miscellaneous Feb 5: American Dist. Teleg. (Phila.)	25	400,000		1 % Q.	21	84
fLehigh Avenue Ry. Co fLombard & South Street Ry	50 25 50		1,000,000	A. & O. \$9 share A, Mar. 98	48 90	901/4	Bell Teleph. Co. (of Canada.)	100 100	8,960,000	8,561,000	2 % 8.	188 €3	65 210
dSecond & Third Streets Ry People's Traction Co gGermantown Passenger Ry	50 50	1,500,000	†6,000,000  572,800	3 %, A., April, '98. \$5.25 share—1898.	144	145	Chicago Telephone Co	100	750,000	750,000	****	200 148 75	150 76
hPeople's Passenger Rycom. hPeople's Passenger Rypfd.	50 25	750,000	740,000 277,402	3 % Jan., 1898.	151	152	Hudson River Telephone Co *Northwestern Telegraph Coguar Providence (R. I.) Teleph. Co	100 50 50	2,000,000 2,500,000	2,000,000 2,500,000	2% × Q.	114 115 90	118
(Philadelphia Traction Co	50 50 50		1400,000 1580,000	\$2 p. sh., Oct. 98. 6 % A—Mar., '98. 86 share—July, '98.	98  158	961/4	Southern New Eng. Teleph. Oo  ELECTRIC LIGHT A	100					
†Empire Passenger Ry. Co †Philadelphia City Pass. Ry †Philadelphia & Gray's Fy. RR	50 50 50	600,000 1,000,000	475,000	\$7.50 share July '98 \$8.50 share July '98	202	203	Boston, Mass.—Feb 5:						
Ridge Avenue Passenger Ry	50 50 50	750,000	200,000	\$12 share, July '98. \$2 share July, '98.	8.8%	309	Fort Wayne Electric trust receipts	25 100	40,000,000	80,460,000	2 % Q., Aug., 1898.	115 35	125
iThirteenth & 15th Sts. Pass. Ry. guar iThirteenth & 15th Sts. Pass. Ry. iUnion Passenger Ry. Co	50 50	1,000,000	1900,000	11/2 % S., July, '98. 811 sh. A., July, '98 89.50 shre, July '98	289	240	†General Electric Co. [old] com. General Electric Co. [new] " TH. Elec. CoT. Secur., Series D.	100	18,276,000	18,276,000	1%% Q., May '99.	117 122	118
iWest Philadelphia Pass, Rv Rochester, N. Y Feb 5	50		[750,000	\$10 share, July '98	200	**	Westinghouse Elec. & Mfg.Co.com. Westinghouse El. & Mfg. Co. pfd. Westinghouse El. & Mfg. Co. assent.	50	4,000,000 11,000,000	146,700 8,996,058 8,195,126	1¾ % Q., Jan., '99.	62	63
Richester Railway Co	100	5,000,000	5,000,000		15	16	New YorkFeb 5: Edison Elec. Ill'g Co., New York		9,188,000	7,988,000		119	120
j seading Traction Co	50	1,000,000 850,000	1,000,000 850,000 \$1,000,000	Semi-an.,Jan. & Jy Jan., '98.	24 188 70	26	*Edison Elec. Ili'g Co., Brooklyn Edison Ore Milling Co Electric Vehicle Cocom.	100	******		1½ % Oct., '98.	8 82	12 92
St. Louis Mo Feb 5	50				10		†General Electric Co. [old]com. General Electric Co. [new] " Interior Conduit & Insulation Co	100 100 100	40,000,000 18,276,000 1,000,000	30,460,000 18,276,000 1,000,000	2 % Q., Aug., 1898. 1½ % Q., May '99.	128	1233
Fourth Street & Arsenal Ry lefferson Avenue Ry. Co Lindell Ry	50 50 100	400,000	150,000 400,000 2,400,000	2 % Dec., 1888. 1¼ % Jan., '99. 1½ % Jan. '99.	::	::	Pittsburg, Pa-Feb 5	100	2,500,000		A. & O.	110	125
Cass Avenue & Fair Grounds Oltizens' RR	100	2,500,000 2,500,000 2,000,000	2,479,000 2,500,000 1,500,000	1½ % Jan. '99.	::	::	Allegheny County Light Co East End Electric Light Co	100 50	500,000 800,000	500,000 800,000	J. & J.	168	172
St. Louis RR.  dissouri RR.  cople's RR. Co.	100	2,000,000 2,400,000	2,000,000	4 %, Oct., '98. 2½ %, Jan., '99. 1½ % Jan., '99. 50c., Dec., '89.	::	::	Philadelphia, Pa.—Feb5 Edison Electric Light Oo	100	2,000,000			141	1443
outhern Electric Ry6 % pref.	100	500,000 1,000,000	500,000 1,000,000	3 %, Jan., '99.	68		*Electric Storage Battery Cocom. *Electric Storage Battery Copfd. Northern Elec. Light & Power Co	100	8,500,000 5,000,000 550,000	550,000		120 116 18	1205 120 185
t. Louis & Suburban Ry	100	2,500,000 4,000,000		3 % A., July, '95.	95	10	Southern Elec. Light & Power Co  Miscellaneous Feb 5:	10	187,500	187,500	••••	80	-
San Francisco, Cal.—Jan. California St. Cable RR Geary Street Park & Ocean RR	100 100	1,000,000	875,000	50c. monthly. \$2.50 share, '96.	116 60		Bridgeport (Conn.) Elec. Lt. Co Missouri-Edison (St. Louis)com.	25	500,000	:::: <b>:</b>		47 25 185	43 28 15
Market Street Ry Presidio & Ferries RR		1,000,000	18,750,000	Q., 60c. per share.	621/8	68 16	Hartford (Conn.) Lt. & Power Co	100 25	850,000 175,000			128 6 195	182
Scranton Pa - Feb 5 Scranton Railway Co	50 100		2,500,000 500,000	***************************************	29 161/4	80	Hartford (Conn.) Elec. Light Co Hartford (Conn.) Lt. & Power Co New Haven (Conn.) Elec. Lt. Cc Narragansett (Prov., R.I.) Elec. Co. Bhode Island Elec. Protec. Co	50 100	1,200,000		2 % Q., Oct., '98.	95 1184	100
n Scranton & Carbondale Trac. Co n Scranton & Pittston Traction Co Sprin rield Ill.— Feb 5:	100			****************			Royal Elec. Co. (Montreal)	100	1,000,000 1,085,000	1,085,000	1% Q 1% % Q 8 % S, Dec. 1, 96.	198	195 138 100
Springfield Consolidated By Springfield O.—Feb 5	100	750,000	750,000	***************************************	***		Woonsocket (R. I.) Electric Co	100	the stock	holders th	e capital stock wa	105 as red	106 luced
Springfield Street Ry	100	1,000,000	1,000,000	***********		- 11	to \$20,827,200, of which \$18,276,000 is o Recently acquired the Edison Ill pany, the Municipal Electric Light	umii Co.	nating Co.	of Brook	lyn and its consti	tuent	com
Springfield, Mass Feb 5: pringfield Street Ry	100	1,200,000	1,166,700	8 % A.	207	212	ALLIE	D	INDUS	STRIE	s.		1
Foronto Canada.—Feb 5 Foronto Street Ry Montreal Street Hallway Co	100	6,000,000 4,000,000			1031/8	1(33/4	Boston MassFeb 5: Delaware Gas Light Cocom	50	500,000	500,000	J. & J.	72%	
Washington, D. C Feb 5:	50				-	5.2	Delaware Gas Light Copref. American Electric Heating Co Street Ry. & Illu'g Propertiespfd	100	10,000,000	1,248,700	J. & J. \$2 p. sh. Jan. 26, '99	98	-
Belt Ry. Co	100 50	\$12,000,000 400,000	12,000,000			92 <sup>1</sup> / <sub>8</sub>	United Electric Securities Copfd.  New YOPKFeb 5:	100		1,000,000	\$8.50 p.sh. Nov 98.		100
Eckington & Soldiers' Home Ry Jeorgetown & Tenallytown Ry Metropolitan RR. Co	50 50 50	200,000	200,000	2½ % Q.	35 15	16	Consolidated Electric Storage Co Safety Car Heating & Lighting Co Worthington Pump Cocom.	100		 F F00 000		10 150	20 155
Worcester, Mass Feb 5 Worcester Traction Cocom.	100	8,000,000	8,000,000		80	31	Worthington Pump Copfd Philadelphia PaFeb 5:	100 100	5,500,000 2,000,000	5,500,000 2,000,000	7 % A	109	110
Worcester Traction Co6 % pfd. Worcester & Suburban Street Ry	100		2,000,000 542,500	3 % S., Feb., '98. 4% %, 1897.	10416	105½ 85	Electro Pneumatic Trans. Co United Gas Improvement Coscrip.		1,500,000 10,000,000		==	1	11/4 162
Wilkesbarre & Wyoming Val. Trac	100	5,000,000	5,000,000	1%, Jan., '97.	25	29	Welsbach Commercial Cocom. Welsbach Commercial Copfd. Welsbach Light Co	5	8,500,000 500,000 525,100		2 X Q	113/4 57/ <sub>2</sub> 42	57%
* Unlisted. † Paid in. † Full a Leased to Hestonville, Man & b Consolidation Electric, Peo	Fair	rmount Pa	assenger k	v. for 6 % on stock	per a	nnum.	Welsbach Light Oo., Oanada Pittsburg, Pa.—Feb 5:	5	500,000	*****	***	15/8	13/4
charges and all indebtedness of contraction Company.	onst	ituent an	d leased	companies assume	d by	Union	Carborundum Mfg. Co Standard Underground Cable Co	100 100	200,000 1,000,000	200,000 1,000,000	· · ·	170	171
c Practically all shares owned d Lease to Frankford & Southw e Leased to Electric Traction C	ark	Passenger any.	Ry. assu	med by Electric Tr	actio	n Co.	Miscellaneous Feb 5: *Barney & Smith Car Cocom. *Barney & Smith Car Copfd.	100 100		1,000,000 2,500,000	7 X	21 98	25 10)
f Controlled by Frankford & So g Leased to People's Passenger h Majority of stock owned by I	Rati	way at \$5 le's Tracti	enger Ral per share. lon Compi	ny.			Billings & Spencer Co Consol, Car Heating Co	25 100	1,250,000	1,250,000	1% % Feb. '98	58 95	60
i Leased to Union Traction Con j Lease transferred to Union Tr	a stic	on Compar	ny.	810.000 per annum	in 1	866-7-8	Johns-Pratt Co	100 100 100	*****		==	4 47	8 52
p.a. \$20,000 in 1839-1900 and \$30 0 0	per i	annum th	ereafter,	payable semi-annu	ally,	rental,	Stillwell-Bierce Cocom. Stillwell-Bierce Coofd. Shultz Belting Co	100	500,000		2 % Sept 1,'98.	96	98
k Dividend of 10 % guaranteed Dividend of 6 % guaranteed b							St. Charles Car Co					89	106

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# BONDS.

PASSEN	SER R	AILWA	Y.				PASSEN	GER R	RAILWI	47.			
	Amou	mt.		Interest				Amo	ant.		Interest		
NAME.	Authorized.	Issued.	Due	periods.	Bid.	Askod.	NAME	Authorized.	Issued.	Due		Bid.	Ashat
Albany N. Y.  Date of Quotation—Feb 5, 1500  The Albany Ry. CoCons. mtg. 5s. The Albany Ry. CoGen. mtg. 5s. Watervleit Turnpike & RR.1st mtg. 6s. Watervleit Turnpike & RR.2d mtg. 6s. Troy City Railway Co	\$500,000 750,000 850,000 150,000	427,500 875,000 850,000 150,000	1947 1919	M. & N. M. & N. M. & N.	*126	1271% 127	New Orleans La.  Date of Quotation—Feb 5, 1900  Canal & Claiborne RR cons mig. 5s. Crescent City RR	\$150,000 5,000,000 416,500 5,000,000 850,000 800,000 800,000	8,000,000 899,000 2,599,500 850,000 800,000	1899 1948 1908 1948 1907 1912	M. & N. J. & J. J. & D.	1051/4 108 112	112 118
Date of Quotation - Feb 5, 1800 United Electric Ry. Colst mtg. g. 4s  Baltimore City Pass. Rylst mtg. g. 5e. Baltimore Traction Colst mtg. g. 5e. Baltimore Trac. Co. Raten. & Imp. g. 6s. Baltimore Traction Co. Balto div. 1st mtg. g. 5s. Baltimore Traction Co. Convertible 5s. Baltimore Traction Co. Convertible 5s. Central Pass. Ry. Colst mtg. g. 5s. Central Pass. Ry. Oolst mtg. g. 5s. City & Suburban Rylst mtg. g. 5s. Lake Roland Elev.,lst mtg. 5s.	1,500,000 1,250,000	1,500,000 1,250,000 1,750,000  117,000	1949 1911 1929 1901 1942 1900 1906 1912 1982 1922	J. & D. M. & N. M. & N. M. & S. J. & D. J. & J. N. & M. J. & J. M. & N. J. & D.	102 743/4 1187/8 119 104/4 121 101 102/4 119 116 117	102½ 75 120 121½  121 117	Date of Quotation—Feb 5, 1900 Atlantic Ave. (Brooklyn)Imp. g. 5s. Atlantic Av. (Brooklyn).lstgen. mtg.5s. †Atlantic Av. (Brooklyn)Cons. mtg. 5s. Bro'dway & 7th Avesteons. mtg. g. 5s. Broadway & 7th Avelst mtg. 5s. Broadway & 7th Ave2d mtg. 5s. Broadway Surface2d mtg. 5s. Broadway Surface2d mtg. 5s. Brooklyn City & Newtownlst mtg. 5s. Brooklyn City & Newtownlst mtg. 5s. Brooklyn Heights RRlst. mtg. 5s. Brooklyn Heights RRlst. mtg. 5s. Brooklyn, Q's Co. & Sub'nlst mtg 5s. Brooklyn, Q's Co. & Sub'nlst cos. 5s.	1,500,000 759,000 8,000,000 12,500,000 1,500,000 1,125,000 1,000,000 2,000,000 1,000,000 2,000,000 1,000,000 2,500,000 3,500,000 4,500,000	1,500,000 759,000 1,966,000 7,650,000 1,500,000 1,250,000 1,000,000 2,000,000 2,000,000 250,000 8,500,000 250,000	1909 1981 1948 1904 1914 1924 1905 1941 1989 1983 1941 1941	M. & S. A. & O. J. & D. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J.	95 1073/2 115 128 104 108 115 105 116 115 101 104 112 107	110 116 125 105) 110 117 106 117 116
Boston, Mass.  Date of Quotation—Feb 5, 1900  **End Street RyDeben. g. 4%s.  **15,674,000 in escrow to retire outstanding bonds of absorbed companies.  Chapleston S. C.  Bate of Quotation—Feb 5, 1900  **Lynn & Boston RRlst mtg. g. bs.  West End Street RyDeben. g. 5%.  **End Street RyDeben. g. 4%s.  **St.,674,000 in escrow to retire outstanding bonds of absorbed companies.  Chapleston S. C.  **Bate of Quotation—Feb 5, 1900	5,879,000 8,000,000 2,000,000	8,702,000 8,000,000 2,000,000	1902	J. & D. M.& N. M. & S.	114 1043/ 112	115 106	Brooklyn Rapid Transitgold 5s. Bleecker St. & Fult'n Fer'y RR. Ist mig. 7s. Cent P'k, N. & E. R. R. Rs. ist cons. mig. 7s. Central Orosstown RRlst mig. 5s. Coney Island & Brooklyn RR. Ist mig. 5s. ZD. Dock, E. Bd'y & Bat'y R. gen.mig. g. 5s. Dry Dock, E. Bd'y & Bat'y RR. scrip 5 %. Eighth Av. RR. Co	7,000.000 700,000 1,200,000 250,000 800,000 1,000,000 100,000 000 000 ,200,000 1,500,000 5,000,000 12,500,000	5,181,000 700,000 1,200,000 250,000 800,000	1945 1900 1902 1922 1903 1982 1914 1914 1915 1998 1997 1909 1909	J. & D. M. & N. J. & J. J. & D. F. & A. F. & A. M. & S. J. & J. M. & S. J. & J. M. & S.	109% 101% 107 125 101 117 102 108 116% 89 124 120 120 120 116%	108 109 108 120 105 117 125
†Enterprise Street RR	500,000 850,000	47,000		J. & J. J. & J	108	****	Third Avenue RR	5,000,000	5,000,000 150,000 2,000,000	1987 1909 1906 1942	J. & J. J. & J. J. & J.	106 118 110	128 108 116 114
Chicago III.  Date of Quotation—Feb 5, 1900  Ohicago City Ry	8,171,000 500,000 500,000 2,500,000 4,100,000 2,700,000	600,000 7,500,000 750,000 4,040,000 8,781,200 15,000,000 500,000 500,000 2,500,000 8,999,000	1903 1929 1907 1982 1928 1942 1906 1911 1900 1927 1928 1911	F. & A. J. & D. A. & O. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. M. & N. J. & D.	1013/4  108/%  96 106  108	1023/4 1022 109  96/6  111 102 107	181,085,000 in escrow to retire gen. mtg. bonds. 184,850,000 in escrow to retire maturing obligations. 1855,2000 in escrow to retire 1st and 2d mtg. bonds. 2In treasury, \$80,000. 11 Guar. by Union By. Co. TOPONTO CANADA. Date of Quotation—Feb 5, 1900 Montreal St. Ry		800,000 2,200,000	1908	M. & S. M & S.		
†Redeemable at option on 60 da. notice. IF unded debt assumed by Ohicago W. Div. By. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.  §Subject to call after Oct. 1, 1899, at 1110 and interest.  Assumed by W. Chicago St. RR. Co., lessee. iInt. guar. by W. Chicago St. RR. Co.  Cincinnati, O.  Date of Quotation—Feb 5, 1900  Oin. New. & Cov.St. Ry. 1st Con.mtg. g.5s.  Mt. Adams & Eden P'k InIst mtg. 6s. Mt. Adams & Eden P'k InIst mtg. 6s. Mt. Adams & Eden P'k InIst mtg. 6s. So. Cov. & Cin. St. Ry	8,000,000 46,000 100,000 581,090 250,000 400,000	2,500,000 48,000 100,000 581,000 250,000	1922 1900 1906 1906	·	113 ½ 108 ½ 114 108 ½ 12 i ½ 182 ½	1141/4 104  1222/4 187	Date of Quotation Feb 5, 1500 Continental Pass. By	800,000 100,000 150,000 250,000 1,125,000 5,698,210 200,000 1,800,000 29,735,000 250,000 250,000 750,000	810,000 200,000 100,000 250,000 458,000 867,000 200,000 1,018,000 500,000 29,724,876 246,000 750,000	1898 1901 1905 1911 1912 1948 1910 1917 1908 1911 1945 1906	J. & J. M. & S. J. & . F. & . A. & O. A. & O.		
Cleveland, O.  Date of Quotation—Feb 5, 1900  Brooklyn Street RR. CoIst mig. 6s. Clin. New't & Cov. St. RyCons. mig. 5s. Cleveland City Cable RyIst mig. 5s. Cleveland Electric Ry. Co. 1st mig. 5. Columbus (O.) Cent. RyIst mig. 5. Columbus (O.) Cent. RyIst mig. 5. Last Cleveland RRIst mig. 5. Last Cleveland RRIst mig. 5s. St. Wayne (Ind.) Elec. Ry. Ist mig. 6s. Lorain (O.) Street RyIst mig. 5s. St. Ry. Co., Grand RapidsIst mig. 5s. 131,900,000 in escrow to retire bonds of obsorbed companies, marked a. Interest guar. by Cons. St. Ry. Co.	600,000 8,000,000 2,000,000 8,500,000 1,500,000 1,000,000 600,000 600,000	2,500,000 2,000,000 1,249,000 1,500,000 1,000,000	1922 1909 1918 1918 1910 1922 1915	J. & J.	1061/ <sub>6</sub> 1181/ <sub>6</sub> 1051/ <sub>6</sub> 106	107 114 ½ 106 107 	Pittsburg, Pa.  Date of Quotation—Feb 5 1900  Birmingham, Knox & Allentown	875,000 1,250,000 1,500,000 50,000 1,250,000	500,060 875,000 1,250,000 50,000 1,250,000 1,250,000 750,000 250,000 1,500,000 1,400,000 2,000,000	1980 1927 1930 1918 1942 1928 1924 1927 1929 1922 1980 1984		110	118
Detroit, Mich. Date of Quotation—Feb 5, 1800 Detroit Citisens'8t. Rylst mtg. 5s. 1. Wayne & Belle Isle Rylst mtg. 6s. the Detroit Ry	7,000,000 400,000 1,800,000	8,885,000 877,000 1,800,000	1902	A. & O.	105	102%	Providence R. I.  Date of Quotation - Feb 5, 1900  Newport Street ByCoupon 5s United Trac. & Elec. Colst mtg. g. 5s	50,000 9,000,000	500,000 50,000 8,260,000	1910	J. & D.	116	118
New Haven Conn.  Date of Quotation—Feb 5, 1100  New Haven St. Rylst mtg. g. 5s. New Haven (Edgewood Div.)lst.mtg.5s. Winchester Avenue RR—Ist mtg. g. 5s. Winhester Avenue RRDeben. g. 5s.	600,000 250,000 100,000 100,000	250,000 500,000	1914 1912	M&N M&S	111 111 109	  	St. Louis.  Date of Quotation—Feb 5, 1100  Baden & St. Louis RRlst mtg, 5s, Cass Ave, & Fair Gds Rylst mtg, 5e, Citizens' Raliway Colst mtg, 5s, Oomp, Hts, Un, De, & Mer. Ter, 1st	F000 000 1,600 000 2,000,060 1 000 000	250,0°0 1,€0∍,000 1,500,000 000 000	1912 1907	J&J J&J J&J	100 2 109 117 With i	102 102 1091 118

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PASSER	IGER	RAILW	AY			
	Am	ount.		Interest		
HAMR.	Authorized	Issued.	Due	periods.	Bid.	Asked
St. Louis.  Date of Quotation—Feb 5, 1100  Jefferson Avenue Ry	1,000,000 400,000 125,000 75,000 2,000,000 2,000,000 500,000 500,000 1,091,000 8,500,000	400,000 1,500.000 700,000 800,000 125,000 75,000 2,000,000 1,400,000 500,000 500,000 1,091,000 1,787,000	1911 1916 1910 1902 1904 1905 1900 1921  1909 1918 1900	F. & A. M. & S. A. & O. J. & D. M. & N. J. & J. J. & J. M. & N. F. & A. M. & N. J. & J. J. & J.	108 108 105 100  100 99% 108 80 105 116 100 121	105 :00 106 102 101 100 × 104 148 104 118 100 × 122
San Francisco Cal.  Date of Quotation— Jan, 1900 California St. Oable RBlst mig. g. 5e. †Ferries & Cliff House Rylst mig. g. 5e. †Metropolitan Ry. Colst mig. g. 6e. †Metropolitan Ry. Colst mig. g. 6e. †Metropolitan Ry. Colst mig. 6e. †Park & Cliff House RBlst mig. 6e. †Park & Cliff House RBlst mig. 6e. †Park & Clean RBlst mig. 6e. †Park & Clean RBlst mig. 6e. 3utter St. Ry. Colst mig. 6e. †Controlled by Market St. Ry. Co	1,000,000 650,000 1,000,000 8,000,000 200,000 2,000,000 250,000 700,000 1,000,000	850,000 671,000 8,000,000 2,000,000 850,000 250,000 700,000	1914 1921 1918  1918 1912 1914 1912	J. & J. M. & S. A. & O. J. & J. J. & J. J. & J. M. & S. M. & N.	114  126 ½ 105 ½ 115	117 117 95  107
Date of Quotation—Feb 5, 1500  Belt By. Co	500,000 500,000 200,000 500,000	450,000 500,000 200,000 500,000	1914 1911	A. & O. J. & D.	182	*****
Bridgeport Traction Co	2,000,000 5,000,000 4,000,000 8,000,000 8,000,000 4,000,000 4,000,000 6,000,000 550,000 1,250,000 1,250,000 1,250,000	1,688,000 8,000,000 2,886,000 2,281,000 572,000 8,800,000 4,981,000 4,050,000 2,878,000 550,000 1,000,000 4,298,000 1,000,000	1981 1988 1982 1982 1988 1988 1920 1988 1990 1919 1928 1928 1928 1902 1981 1980 1987	J. & J. F. & A. M. & N. J. & J. J. & D. J. & D. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J.	108 118 104 112 115 111 <sup>1</sup> 4 115 20 80 119 11014 108 1085 1093	110 103 1118 1113/4 1163/4 1103/4 1103/4 1106
		<u> </u>			*With	nt'rest
ELEOTRIO LIGHT AND	ELE	OTRIC	AL	. MFC	<b>3.</b> O	os,
Boston, Mass.  Date of Quotation—Feb 5, 1600  Delaware Gas Lt. Co	800,000 2,026,000 10,000,000	800,000 8,750,000	 1922 1911	J. & J. Quar. J. & J.	106 167 116	•••••
	500,000 195,570 4,812,000 15,000,000 5,000,000	4,812,000 2,188,000		M. & S.	109 124 12214	
Idison Elec. Ilig. Co. (Brooklyn)dison Electric Light (Philadelphia) (Ings Co. El. Lt. & Pow. Co. lst mig. 5s. Kings Co. El. Lt. & Po. Co. pur. money 6s. Milwaukee El. Ry & Lt. Co. lst con. g. 5s. United Elec. Light & Power Co(N. Y.)	2,000,000 2,500,000 5,176,000 8,000,000 5,000,000	2,500,000 5,176,000 6,108,000	1987	A, & O. A & O. F. & A.	100 120 102 /s	103
TELEPHONE	AND	TELEG	I PO	. <del></del>		
Miscellane of the state of Quotation - Feb 5, 1900, American Bell Telephone		•••••	1908	F. & A.  J. & D.	100½  114 108	101  115 106
ALLIED	INDU	STRIES	<b>S.</b>			
Miscellaneous.  Date of Quitation—Feb 5, 1100  American Electric Heating	500,000  75,000		1942 1904	J. & J J. & D.	106	25 107

### NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 157@16c.; Lake, 16@16ic., casting, 151@153c.

The American Wireless Telegraph Company, Milwaukee, Wis., has been incorporated with a capital of \$1,000,000

A movement is said to be on foot to amalgamate all automobile and bicycle interests in this country in a \$200,000,000 trust.

The Excelsior Telephone, Telegraph & Subway Company has been incorporated in New Jersey with a capital of \$5,000,000.

The Utica Belt Line Street Railroad of Utica, N. Y., will lease the Suburban Railroad line from Whitesboro to Oriskany, guaranteeing its bonds.

The stockholders of the Commercial Cable Company will hold their annual meeting on March 5. Books close February 21 and reopen March 7.

Gross receipts of the Chicago Union Traction Company for January increased \$55,362; for seven months ended January 31 the increase was \$318,000.

The report of the Metropolitan Street Railway of New York City for January shows gross earnings of \$1,162,352—ahead of January, 1898, by \$117,803.

August Belmont & Co. are behind the McDonald Rapid Transit tunnel contract arry out the undertaking as to the cash deposit of a million and the bond for to carry out t

The Chicago Telephone Company has filed with the County Recorder a certificate of increase of its capital stock from \$5,000,000 to \$15,000,000, authorized at the recent annual meeting.

The Westinghouse Manufacturing Company has declared a quarterly dividend of 14 per cent. on common stock, payable February 2). Books close February 12 and reopen February 21.

Mayor Van Wyck, of New York has signed the rapid transit bill. It has been sent to Albany were it is expected Governor Roosevelt will sign it at once. This permits the city to sell tunnel bonds in various amounts.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 17(2,20; New York Electric Vehicle Transportation, 9(2)91; New England Transportation, 6(2,6)2.

The Chicago "Tribune" states that at the annual meeting of the stockholders of the National Carbon Company, on February 26, Arthur J. Eddy, of Chicago, who promoted the Company, and others will resign. Their places will be filled with men familiar with the business.

At a recent meeting of the directors of the Worcester. (Mass.) Electric Light Company, it was voted to increase the capital stock from \$300,000 to \$400,000. The purpose of this President Rogers informed a reporter, was to secure capital to enable the corporation to underground its system.

The Chicago Telephone Company, by John M. Clark, President, and Charles E. Mosely, secretary, on Saturday filed with Recorder Simon a certificate of increase of capital stock of the company from \$5,000,000 to \$15,000,000 This is in 150,000 shares of \$100 each. The increase was determined upon by the directors of the company at the annual meeting of the company held on January 17.

The United Power & Transportation Company, under the direction of President John A. Rigg, says the "Philadelphia Stockholder," is steadily widening its field of operations. It controls trolley systems and electric lighting plants in Wilmington, Del., New Jersey, Norristown, Reading. Lebanon, Wilkes Barre, and other cities. Its latest acquisition is reported to be the Southwestern Traction Company, of Philadelphia. of Philadelphia.

The semi-annual dividend of 2½ per cent. has been declared by the Northern Ohio Traction Company on its preferred stock of \$500,000. The company is the first to pay a dividend of all companies which have ever owned the local system. The company has announced that several improvements will be made during the coming summer, which will include double tracking the main lines.

A dispatch from Chicago says that a postponement is announced in the date for the payment of the second \$5 installment on the shares of the Illinois Electric Vehicle Transportation Company. With it comes the official information that a proposition is under consideration for the reduction of the capital stock from \$25-000,000 to \$2,500,000,and the par value of the shares to \$10, instead of \$100. Only \$5 per share has so far been called.

The Brooklyn Rapid Transit directors met on the afternoon of February 1 and elected Anthony N. Brady as chairman and those officers: President, Clinton L. Rossiter; vice-president, H. C. Du Val; secretary and treasurer, T. S. Williams, and assistant secretary and treasurer, C. D. Meneely. The following directors were chosen as members of the executive committee, with the chairman of the board and president ex officio: A. R. Flower, E. H. Harriman, Walter G. Oakman, H. H. Porter and Henry Seibert.

H. H. Porter and Henry Seibert.

The Electric Storage Battery Company's sales for the year ended December 31, 1899, will amount to approximately \$3 500,000, an increase of nearly 200 per cent. over 1898, when the business was \$1,300,000. The current business is averaging about \$250,000 a quarter, or exceeding a rate of 6 per cent. on the outstanding capital stock. The company has at present in banks \$125,000; goods manufactured, but undelivered, \$500,000; bills outstanding unpaid, but good, \$750,000; total working capital, \$1,375,000. The company owes nothing except current bills, not exceeding altogether \$60,000 and has no bonded or other indebtedness.

altogether \$60,000 and has no bonded or other indebtedness.

A special meeting of the stockholders of the Imperial Electric Light, Heat and Power Company has been called for Sturday, March 10, to vote upon a proposition to establish a bonded indebtedness of \$1,500,000, to be secured by a deed of trust upon all the property of the company. Other business of importance will also be considered at the meeting. The Imperial Electric Light, Heat and Power Company was purchased a short time ago from its former owners for \$952,000. It was originally intended to capitalize the company at \$1,000,000, and to issue the same amount of bonds, which were to be sold to pay for the plant, but later it was ascertained that it would be necessary to make some extensive improvements A large bond issue was consequently found to be necessary. The Imperial Company was absorbed by the Consolidated Electric Company, with was incorporated for \$1,500,000.

Mr. Edward Lauterbach, counsel for the Third Avenue Railroad Company, is reported as saying: "The Third Avenue Railway has arranged to exchange all present indebtedness into 6 per cent. notes secured by mortgage running three years with the privilege to the company to retire any or all of the same at the end of any twelve months. The notes will not contain any clause permitting their convertibility into stock. This disposes of all the company's requirements except of about \$2.500,000 further indebtedness which may be incurred in connection with completing construction work. No payment will be necessary for some time in connection with such expenditures and the company has at least two different methods of obtaining supply money for this purpose and upon terms perfectly fair to the company. Within a short time after the issuance of notes it is intended to present a plan to stockholders for the permanent funding of the company's debt and for all other necessary purposes the principal feature of which will be a low rate bond to be first offered to stockholders but underwritten by the syndicate."





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# FLECTRICITY

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### EDITORIAL NOTES.

The Future of Wireless Telegraphy.

The gradual evolution of wireless telegraphy is to be analogous to the

evolution of the present telegraph system.

The first constructions by Morse were quite limited in practical working distances, and the present elementary experiments of Marconi and his imitators, are likewise limited and to about the same extent.

Marconi has lately operated over somewhat longer distances in his late exhibitions in this country than in his former trials in England and on the Continent; but he and his friends despaired of effective service, from present constructions, over a distance of one hundred miles. He is unable to concentrate the electric undulations into a bundle of rays, having a definite direction or to concentrate or focus them on the distant receiver. They diverge in all directions from the common center of the transmitter and they are wonderfully weakened by dissipation in surrounding space.

Some of our electrical authorities very much doubt the practicability of wireless systems of communication to distances beyond an unobstructed line of vision, on account of the earth's curvature, and for this reason we see some experimenters climbing mountains to increase the electrical horizon of vision, while others are dreaming of balloons and Eiffel towers.

Prof. Bell's telephonic toy became a commercial success when the microphonic transmitter came to his assistance, and Prof. Morse secured undying fame as a public benefactor when the automatic relay was used to take up his messages and, so to speak, reinforce the enfeebled electric current and thus enable the telegraph to be used as an instantaneous messenger from one side of a great continent to the other,

Wireless telegraphy, and later on a wireless telephony must soon pass through a similar development to secure a wide commercial utilization.

At present investigators are doubtful of their ability to send the undulations from the wireless transmitter along a well defined path of parallel rays.

Possibly all fundamental inventions arise from a consideration of analogies and we may find the solution of this problem in the analogy offered by the X-ray generating apparatus,

where vibrations are produced of a character quite closely resembling the vibrations produced by the wireless telegraph transmitter; the X-ray vibrations may be focused as well as made parallel in the line of their propagation. They may be projected in most any desired definite path with little dissipation of their energy in undesired directions.

The next perplexing problem is to keep one set of wireless telegraph instruments from interfering with any other set, and to preserve the secrecy of messages; the analogous solution of this problem may be found in the harmonic telegraph, as well as in the various multiplex systems; thus it appears from well known and practical commercial analogies that the wireless telegraph will undergo a process of evolution, fitting it for widely extended utility that will greatly lessen the cost of thought transmission, by lessening the cost of installations, by cutting out the heavy expenses of copper wire, insulations, poles, armor, conduits, and the cost of their repairs.

Buoy relay stations may possibly some day give us a system of trans-oceanic communication that will prove to be a formidable rival to our present feeble cable system.

The rapid appreciation in price of guttapercha is fast limiting oceanic cable construction, and a wireless substitute cannot come too soon.

With routes well defined, steam ships may be kept in constant communication with the world, and travelers on these miniature floating cities, may yet read their daily morning papers after breakfast the same as though they were at home.

It is well known that the philosophic conceptions of many of our great inventions originate in Europe, and in another column will be found a description of the latest attempt toward the development of the wireless telegraph, which is well worthy a careful perusal.

\* \* \*

Litigation Over Moving Pictures.

Last week the Commissioner of Patents in Washington rendered a final decision—at least

so far as the Patent Office is concerned—in the suit of Thomas Armat versus Herman Casler and Woodville Latham as to the priority of invention of moving picture machines. Previous to this decision Mr. Armat had won before the Board of Appeals of the Patent Office.

The machines that infringe are the biograph,

the projectoscope made by the Edison people; the cinematograph and the vitascope.

As things now stand exhibitors of moving pictures in all parts of this country as well as American exhibitors in many European countries, where patents have been taken out by Mr. Armat, will have to pay royalties. This monopoly of moving pictures is controlled by the Photo-Projecting Company, which was recently capitalized for \$500,000 under the laws of this State, and to which Mr. Armat has transferred all his patents.

That more will be heard of this matter, and that it bids well to become a "cause célèbre" and a harvest for lawyers, may be inferred from the fact that the case will be carried to the United States Supreme Court, and every effort made to have the recent Patent Office decision reversed.

\* \* \*

Congressional Measures of Great Importance. The fact that the exports of electrical machinery increased from \$2,523,644 in 1898 to \$3,143,336 in 1899 is significant of the rapidly spreading con-

viction among electrical manufacturers that it is imperative for them to seek in foreign countries fresh outlets for their productions. In this connection it is highly gratifying to note that Congress is beginning to recognize the growing importance of the export trade to the manufacturers of the country and is considering legislation designed to aid manufacturers in the enlargement of foreign markets for American goods. A number of measures with this object in view are now before the National Legislature, and an epitome of the more important ones is herewith presented. Manufacturers and merchants should take up these subjects in an energetic way and impress their views upon Congress, giving the various measures hearty support.

Manufacturers generally have long felt that some means should be taken by the United States to educate the men who are in the future to be the controlling element in the development of the trade and commerce of the country. Germany has made tremendous strides in the last few years in the development of her foreign trade, and it is due principally to the intelligence, enterprise and skill of the men sent by that country to all parts of the world. These men have been educated in the trade and technical schools throughout Germany, with the result that they are the bestequipped men in all parts of South America, Europe and Asia engaged in selling foreign goods. In order to put the United States on an equality with Germany in this respect Representative Fitzgerald, of Massachusetts, has introduced a resolution calling for the appointment by the President of a commission of five persons to investigate the trade and commercial relations of this country with other countries with a view to the establishment of a national commercial university in Washington. The author of the resolution deems such a university absolutely necessary if we expect to hold our own with the advanced methods of the English and German salesmen.

The efforts which manufacturers in every branch of industry have made during the past ten years to secure the establishment of a department of commerce and industries bid fair to be crowned with success. A bill to create such a department has been favorably reported by a sub-committee of the Senate

committee on commerce and a little more urging on the part of manufacturers will undoubtedly result in the establishment of the new department by the end of the present fiscal year. The new department will have complete jurisdiction over all matters relating to the manufacturing interests of the country, including the extension of foreign markets for manufactured goods.

Another meritorious measure is that asking for an appropriation of \$200,000 to enable the Philadelphia Commercial Museum to increase its facilities for supplying commercial information to chambers of commerce and other trade organizations throughout the country. The money is to be expended mainly in the work of completing the collection of specimens of merchandise, both foreign and domestic, now in the Museum, so that American manufacturers may be enabled to learn the grade of articles in their lines most favored by foreign buyers, and how goods must be packed for shipment to other countries. The bill especially provides that the data obtained by the Museum from its foreign agents and other sources shall be distributed free to trade organizations throughout the United States.

Other grist in the National Legislative mill includes bills to reorganize the consular service. to establish the metric standards of weights and measures, to incorporate the National Association of Manufacturers, for the purpose of giving additional stability to that organization, and for the appointment of a commission of industrial experts to study trade conditions in the Orient with a view of increasing American trade in that vast territory. It will be seen that all these various measures are designed to directly or indirectly promote the export trade of this country and as nearly every manufacturer is interested in the export problem the speedy passage of these measures should be urged upon Congress.

#### UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

B. H. SCRANTON, president of the American Electrical Heater Company of Detroit, reports that his concern has already forwarded an excellent exhibit to the Paris Exposition.

There is a clamor from the citizens of Washington, D. C., for three-cent car fares and all night service. Congress has been appealed to for the purpose of securing a reduction in the cost of fares. Washington is one of the few cities in the country where six car tickets are sold for a quarter, good on any of the different electric lines. Although this is better treatment than is afforded in most cities, the citizens are not satisfied, and a bill has been introduced requiring the sale of eight tickets for a quarter. The measure was introduced by Congressman Mesick and is now before the Committee on District of Columbia. American Street Railway Association is keeping a sharp eye on the bill, and is represented by Tom Lowry of Wisconsin.

Chrys Moller, formerly interested in a cable line in Sioux City, Iowa, has returned to America for the purpose of getting the equipment for an electric railway to connect the foreign quarter of Tien-Tsin, China, with the native walled city of one million inhabitants. English and Japanese capitalists have

secured the franchise, which is the first for an electric railway in the Flowery Kingdom. The railway will be three miles in length and the street along which it will run is one of the most densely populated in the world. The Chinese, Mr. Moller says, have no objection to electric railways.

MR. IRA A. McCormack, one of the popular electric railroad men of the country, formerly general superintendent of the Brooklyn Rapid Transit Company, and recently general manager of the Syracuse Rapid Transit Company, has been offered and has accepted the post of general manager of the Cleveland Electric Railway Company. His resignation from the Syracuse Railroad has been accepted by its board of trustees. He will leave as soon as the latter can determine on a successor. Mr. McCormack regrets that he is compelled to break the pleasant social relations he has established in Syracuse, but as the Cleveland opportunity is in the nature of a promotion he has decided to accept the place.

AMERICAN construction companies have been asked to bid on an electric power plant at Cuantla, Mexico; an electric power station at Rio de Janeiro, Brazil, and an electric railroad from Salonica to Langaza, Turkey.

THAT hustler in the street railway world, Mr. John I. Beggs, general manager of the Milwaukee Electric Railway & Light Company, has let a contract for 300 clocks which are to be placed in the street cars in Milwaukee. As these clocks are of the navy lever type used on battleships and calculated to withstand the concussion of heavy guns, it is expected that they will stand the vibration and jar of Mr. Beggs' street cars, not to mention the jarring effect of the street railway arguments in that city. The clocks are guaranteed for a year. Conductors are to set these clocks by Western Union time every morning and they are expected to be never more than a few seconds incorrect and to do away with any possible controversies about the hours when commutation tickets are available.

The Fire Department of New York is testing a two and one-half inch electric hose, which has just been introduced in Boston. Near the nozzle is a button, by pressing which the firemen can communicate with the engineer by a code of signals.

Special Plenipotentiary Kasson, on behalf of the United States, and Baron Fava, the Italian Ambassador, for his Government, at the State Department on Thursday signed a reciprocity arrangement under the third section of the Dingley act. This arrangement does not require the action of the Senate, but it does need the ratification of the Italian chambers. Until that has been attained it is deemed wise to withhold the full text of the agreement from publication. it was learned, however, that the concessions made by Italy to the United States are quite extensive, including reductions on electrical machinery.

THE Legislative Committee of the Builders' Exchange in Cleveland, O., is pushing a bill to compel electricians and men working in electrical construction to secure a license before being allowed to work in the business. The bill should become a law, as at present a great many unskilled and incompetent men



work in electrical construction, and this fact is a menace to both life and property.

A DISPATCH from San Francisco, Cal., states that the officers of the cable sounding ship Nero have received strict orders from Washington not to disclose the results of the survey for the Pacific cable, but there is a strong intimation that a splendid route has been found. The returns have been dispatched to Washington, and it is likely that the result will soon be officially announced.

WILLIAM STEINITZ, the well-known chess expert, was obliged to be confined last week in the insane ward of the Harlem Hospital of this city, owing to his having labored under the delusion that he was a walking dynamo and could give persons an electric shock at will.

WE desire to acknowledge the receipt of an exceedingly attractive and nicely gotten up little desk thermometer from the Shelby Electric Company of Shelby, O.

An idea of the extent of the work being done in the development of electrical power at Shawinigan Falls, Que., for the Shawinigan Water & Power Company, may be had from the fact that 13 steam derricks, 20 steam drills, 21 stationary engines are used in the works. A trunk railway line, three and a half miles in length, has been built, on which 94 freight cars and 3 locomotives are now in operation. In one day 985 car loads of stone were shipped, and the average daily shipments for the last six oreight weeks have been 700 carloads. About 700 pounds of dynamite are used daily, and a stock of 2,400 pounds of the same explosive is always on the spot. The head race will be 1,900 feet in length and 125 feet deep, and the crib dam, it is said, will be one of the largest built on the American Continent.

REFERRING to the shell factory of the Boers recently destroyed at Johannesburg, the "Electrician," London, states that all the machinery in the plant was driven by electric power, and that originally it was the largest engineering works of the kind in South Africa, the machinery alone having cost some \$400,000.

JOHN O'LEARY of Cohoes, N. Y., has been granted a patent on a convertible motor car, Mr. O'Leary already holds three patents on a car of this type. He will exhibit his models to State railroad officials in Washington, Philadelphia and New York.

A GREAT enterprise has been started in Venice, Italy, for supplying the city with electrical energy from water-power plants established on the rapidly descending rivers, Cellina and Piave. The State Department has received a report on the subject from United States Consul Johnson, of Venice, in reply to an inquiry from a New York export association. Among other things Mr. Johnson says: "The Cellina, with an annual average capacity of twelve cubic meters (423.7 cubic feet) per second and in two falls of the combined height of 100 meters (328 feet), is able to supply Venice with electrical power equivalent to 10,000 horsepower at a distance of fifty-nine miles. The Government is ready to grant the concession and the work can be begun immediately. The Piave offers more favorable conditions. From the latter would be derived fifteen cubic meters (529.7 cubic feet) per second; that is to say,

one-third of its capacity in the dry season, which would serve to feed Lake Santa Croce at a level of 380 meters (1,246 feet) above the sea. From the water of overflow, which would serve for the irrigation of the plain between the Piave and the Livensea, 27,000 horse-power can be conducted.

A CABLE dispatch from Germany to a daily paper states that German alarm at the American plan to transport to Moscow, Russia, and there display the bulk of the United States' exhibits at the Paris Exposition, will surely bring forth a counter exhibition, which will be made possible by the granting of State assistance. The Russo-German Society of Berlin is perfecting plans for an iron industrial exhibition at Moscow, so that at the same time, after the Paris fair, there will be German, English and American exhibitions in the second capital of Russia. The German manufacturers of motors, tools, manufacturing machinery and implements will be represented.

RECENT experiments in New York City have shown the possibility of conveying medicines through the skin, and into any portion of the human body, by placing them in the path of an electric current. Gout, rheumatism and consumption are now being treated by utilizing electricity to convey drugs to the affected parts, and, while no positive cures have been wrought, results have been attained that seem to demonstrate the value of the new treatment. Dr. Samuel G. Tracy, who has been experimenting in this line, in a recent interview is reported as saying: "I do not pretend to have discovered the use of electricity to introduce drugs through the pores of the skin. Electricity was thus employed by Richardson in England to produce voltaic narcotism in 1859. Nothing practical came of the experiments made at that time, but within the last two years it has again been taken up by physicians in Europe, and one or two in this country. Cataphoresis is the name medical men give to the method of introducing drugs into the system through the pores of the skin or through the mucous membrane, instead of by the mouth or hypodermically. Cataphoric action is purely a physical process. It may be illustrated by placing an equal amount of liquid in two receptacles separated by a membrane, and passing an electrical current through from one to the other. The liquid will flow through the membrane in the direction of the current, from the positive toward the negative pole. Now, if a drug is placed in a specially prepared positive electrode, which is held against any portion of the body, and the negative electrode is applied to another portion of the body, the medicine will be driven through the skin and taken up by the blood vessels and fluids of the body."

M. ALIAMET describes in a French contemporary, "L'Electricien," a neat combination of ammeter and voltmeter in one case for use on electric automobiles. The instrument in question, says the London "Electrical Engineer," is made on the Weston principle, but the maker's name is not given. It consists of two sets of permanent magnets with iron cores, round which two movable fine wire coils with indicating pointers are pivoted. One of these is connected up as a voltmeter across the terminals of the accumulators, with a resistance in series with it. With this in-

strument the voltmeter is made to read up to 120 volts. The ammeter coil is connected to a low-resistance shunt in the main circuit. The ammeter is made to read in two directions, being graduated up to 40 amperes for the charging current and 100 amperes for the discharge. The scales on the face of the instrument are, of course, on two different levels, the voltmeter pointer moving on a plane slightly above that of the ammeter pointer. The graduated scale of the voltmeter in this way obscures the larger part of the ammeter pointer. The idea of combining the two instruments in one case is a good one, as the space available for such instruments on an electric carriage is limited.

#### The Automobile Trust Ready for Business.

Mr. F. D. Carley of New York City, who is vice-president of the big \$75,000,000 Anglo-American Rapid Vehicle Company, is reported as saying: "We intend—and we feel that we can carry out our intentions—that this company shall bear a stronger relation to automobile interests than the Standard Oil Company does to oil interests." Mr. Carley also stated "that he would leave Wall street to devote himself exclusively to this automobile company."

The Anglo-American Automobile Company comprises six of the largest British automobile concerns and the Studebaker, Riker and other big American plants, and has more than two hundred patents recognized all over Europe and this country. Its board of directors includes Sir Edward Sullivan and H. B. Twyford. The president of the company is W. W. Gibbs, of Philadelphia, who some time ago sold his interests in the big American Vehicle Company to William C. Whitney. C. E. Platt, a Philadelphia millionaire, is secretary-treasurer. The company's estimated output for the coming fiscal year is forty thousand auto-vehicles.

The company has taken the Victoria Hotel property at Fifth avenue and 27th street, this city, for show-rooms and will have more than thirty types of vehicles on exhibition soon. Mr. Carley also said:

"This corporation has in view solely the manufacture and sale of automobiles. It is not in any sense a stock operation. The stock has been placed in trust and no portable certificates of deposit will be issued against it."

#### A Large Telephone Order.

The Mississippi Valley Telephone Company, Minneapolis, Minn., has recently placed an order with the Stromberg-Carlson Telephone Mfg. Co., Chicago, for the complete equipment for a branch exchange in St. Paul and also additional equipment for increasing the Minneapolis exchange, which is being made up and furnished as rapidly as possible.

While the completion of the two exchanges has been somewhat delayed, owing to the scarcity of raw material, it is however, progressing as rapidly as can be expected in a system of the extent of the two plants.

The two exchanges, when completed, will represent an investment of more than a million dollars and all the capital has been furnished by J. C. Hubinger, "America's Starch King." of Keokuk. Iowa.

King, "of Keokuk, Iowa.

These plants, when completed, will without question be the largest individual telephone holdings in the independent field. The plants are constructed first-class metallic throughout and are equipped with the S-C. "Central Energy" system and multiple switch-boards.

Both the Minneapolis and St. Paul exchanges are now in operation and the plants are being rapidly extended.

#### LONDON NOTES.

# [From our London Correspondent.] Electrical Engineers and the War.

The interest which American electrical engineers took in the Spanish-American war is being repeated among English electricians at 🤻 the present moment. In addition to numerous officials from municipal and other lighting stations in different parts of the country who have volunteered for active service and been accepted, a party of fifty electrical engineers who along with Major Crompton recently offered for South African service have received notice that their offer has been accepted. This party is already furnished with six searchlight equipments and \$7,000 is being subscribed privately among the electrical profession for furnishing the men with personal comforts. In addition to this the war office has set apart \$15,000 for thoroughly equipping the detachment in order that the greatest possible benefit may be obtained from the services. Searchlight and other practice is now proceeding at Chelmsford where Messrs Crompton's electrical works are situated. It will of course be at once gathered that this offer is the direct outcome of the formation in 1896 of the Royal Engineers Electrical Volunteers in which the late Dr. John Hopkinson took so active an interest.

#### Electrical Patent Litigation.

On January 22 a very important action commenced hearing before Judge Farwell in the Chancery Division, London. It is taken by Mr. Martin Rucker, of company promotion fame, who has become the owner of certain Zipernowski and Deri transformer patent rights, which he claims have been infringed by the London Electric Supply Corporation and about half of the electric lighting authorities throughout the kingdom. All the parties likely to be affected by a decision have banded themselves together and are sharing the costs of the defence, although the only defendant whose name appears is the London Electric Supply. The fight promises to be a good one for experts, for upon the opening day about a dozen electrical engineers more or less eminent were in attendance. Lord Kelvin, Prof. Silvanus P. Thompson and Mr. Swinburne were among the number. It looks as though the case may last a week or more, and probably then the judge will take time to consider his decision as is usual in these cases. There is the usual array of eminent counsel. The fight is by far the most important piece of electrical litigation that has happened here during the past year or two, although there is considered to be not much doubt as to what the result will be.

#### To Meet Steamships.

George H. Daniels, general passenger agent of the New York Central & Hudson River Railroad, has added a steamship bureau to the equipment of the passenger service of the road. He has engaged Captains Louis Ingwersen and F. A. G. Schultze to superintend the bureau. and one of their duties will be to meet all incoming transatlantic and the principal coastwise steamships to assist passengers who wish to leave the city via the Vanderbilt system. Capt. Ingwersen will have charge of the American, Cunard, White Star, Atlantic Transport, Wilson, Anchor and Allan-State lines, and Capt. Schultze has been assigned to the North-German Lloyd, Hamburg-American, French, Rotterdam, Red Star and Thingvalla lines.

# A LIFE TEST OF INCANDESCENT LAMPS.\*

#### BY GEO. D. SHEPARDSON.

About three thousand years ago a famous engineer and electrician built on a high hill a temple so thoroughly protected that in the thousand years of its existence it is said not to have been struck a single time by lightning. This wise man one day wrote: "Of making many books there is no end, and much study is a weariness to the flesh." Had he been a modern electrical engineer, he might have added: "Of making incandescent lamp tests there is no end, and much report of them is a weariness to the flesh." Yet new books are useful in presenting old or new truth in a fresh light; so tests of incandescent lamps may be useful in calling attention to points that may not be familiar to all and that are not realized by all. In this paper it is not intended to present a general discussion of the whole lamp situation, nor to give a resumé of what others have done, but simply to report results of certain tests a little out of the usual order.

The general subject of the importance of testing incandescent lamps, together with a report and discussion of the results of an extensive and careful test of lamps made by a large consumer, may be studied in an excellent article in "Electrical World and Engineer," of March 18, 1899, Vol. XXXIII, page 337, and in a valuable pamphlet published by the General Electric Company. For the test mentioned above, lamps of twelve different factories were purchased in the open market and were given a preliminary test for uniformity of candle power and wattage. Four makes of lamp were rejected at once on account of lack of uniformity. Ten lamps of each of the remaining makes were selected for a life test, those being selected which came the nearest to the standard rating and efficiency. This test may therefore be taken to show the best results of the best lamps of the best makers.

In order to discover what is likely to be the experience of the buyer who lacks either the ability or the inclination to test all lamps received, and to reject those which do not meet his specifications as to candle power and wattage, the following experiments were carried on in April and May, 1899. To secure average conditions prevailing in the Northwest, lamps rated at 16 candle power were picked at random from the stocks of the Minneapolis General Electric Company, the St, Paul Gas Company, the Faribault Gas & Electric Company, the Owatonna Electric Company, the Electrical Engineering Company of Minneapolis and from the agents of two lamp factories which were already represented by lamps secured from other sources. Current was kindly furnished by the Minneapolis General Electric Company. The experiment was conducted by Henry A. Hildebrandt and Arthur C. Pratt, senior students in the University of Minnesota. The lamps were run on an alternating current line whose voltage was maintained constant within a range of two volts, a recording voltmeter giving a continuous record of the fluctuations. The candle power, wattage and efficiency of the lamps were determined with direct current and a Lummer-Brodhun photometer with Weston voltmeter and Whitney milliamperemeter, which were calibrated before and after the test. The standard of light was a well aged incandescent lamp which had been standardized by a certified amyl acetate lamp and by standard candles, being frequently checked by a second and similar standardized incandescent lamp.

Ten lots of lamps from seven lamp factories were first tested for candle power and wattage at their marked voltage. shown by the tables [on page 85] the initial candle power of the 55 lamps varied from 14.1 to 23.0, while the watts per lamp varied from 47.3 to 71.3, the watts per candle varying from 2.32 to 4.10. The average candle power of the lamps of each group varied from 15.2 to 22.0, while the average watts per lamp varied from 49.0 to 66.4, and the average watts per candle varied from 2.42 to 3.60. The general average for the 55 lamps given a preliminary test gave 18.3 candle power at 55.8 watts, or 3.1 watts per candle. This indicates that the central stations in this Association are using lamps of higher efficiency than was common a few years ago, also that there is still a wide range in the candle power, wattage and watts per candle of the lamps in use. It might be noted that the watts per candle were specified on only one lot of lamps, another being called "of standard efficiency," while a third lot was called "high efficiency," the latter taking about three watts per candle.

The different lots of lamps were marked A. B, C, D, E, F, G, H and I, and four lamps were selected at random from each lot except I and H. The ratio between the mean horizontal candle power and that in a certain marked position was carefully determined. Lamp sockets were wired to heavy leads, and resistances were adjusted so that each lamp received the voltage marked on the label. The sockets were placed so that the lamps were horizontal and each lamp was always placed in the same socket in order to make the conditions of dropping alike for all. At intervals of about 24 hours, each lamp was removed to the photometer and tested for candle power and current. Each lamp was allowed to burn until the end of the test or until it broke or met an accident. It was not thought advisable to throw out each lamp when it dropped to 80 per cent. of its initial candle power, since it is believed to be the exception rather than the rule for the smaller stations (not excepting most of the larger) to pay much attention to the "smashing point" or economical life of an incandescent lamp unless a customer complaines about poor light. (It might be considered unprofessional to inquire how many of the stations represented in this convention have any regular system of removing old and inefficient lamps.)

After burning about 50 hours, it is found that the light varies from 8.2 to 23.0 candle power, while the watts per lamp vary from 45.7 to 72.1, the watts per candle varying from 2.32 to 4.10, the general averages being 17.5 candle power at 55 watts per lamp and 3.27 watts per candle.

After about 100 hours, the light varies from 10.1 to 22.3 candle power, the watts from 45.5 to 72.1 per lamp and from 2.52 to 5.02 per candle. The general averages are 17.5 candle power at 55.3 watts per lamp and 3.30 watts per candle.

After about 400 hours, the light varies from 11.3 to 19.0 candle power at 46.6 to 70.2 watts per lamp and 3.00 to 4.31 watts per candle. The averages give 16.0 candle power at 56.5 watts per lamp and 3.54 watts per candle.

After about 600 hours, the lights vary from 11.4 to 18.8 candle power at 44.0 to 69.9 watts

<sup>\*</sup>Paper read at the eighth annual meeting of the Northwestern Electrical Association, Milwaukee, Wis., Jan 18, 1900.

per lamp and 3.34 to 4.26 watts per candle. The averages give 14.7 candle power at 55.6 watts per lamp and 3.82 watts per candle.

A few lamps were burned 800 to 900 hours, after which time the candle power varied from 10.8 to 16.4, while the watts per candle varied from 3.60 to 4.40.

Early in the test it was noted that several of the lamps "burned blue" and their high efficiency pointed to an early demise. All four of the lamps of lot A had burned out in about 100 hours and none of those in lot B lasted more than 500 hours, only one of them lasting 350 hours. These two lots were from lamps bought by a large company who contemplated changing lamps, and it is not certain whether these lamps were high economy lamps sent for trial or whether they were lamps intended for lower voltages but marked to suit the voltage ordered. Their performance suggests that the lamp makers find it necessary to dispose of their product and must mark their lamps to suit orders if the orders persistently call for lamps of the same standard voltage. It emphasizes the request made by some of the lamp makers that stations would find it to their advantage to adopt some odd voltage in order to use the lamps which must be made to supply other standards.

To get some comparison between the behavior of lamps on constant potential circuit and those on a circuit with poor regulation, several lamps were placed on a circuit varying from 104 to 118 volts. The lamps so placed were not sufficiently numerous to give close conclusions. The high efficiency lamps all died within about 300 hours, while most of their mates of like make on the well regulated circuit were in fair condition at 800 hours. The candle power and efficiency of the lamps on fluctuating circuit fell in 300 hours as much as did that of the lamps on the constant potential circuit in 800 hours. The lamps on the circuit with voltage fluctuating 13 volts aged at least three times as rapidly as their equals on a circuit fluctuating two volts. Such a statement can only give a rough idea of the general effect since the result of a fluctuation depends upon whether it varies above or below the normal. The lamps of low initial efficiency (that is, those which took 3.5 to 4.0 watts per candle) withstood the extreme variation much better than did those of higher efficiency, as was to be expected.

After the above test had been ended, some of the lamps were placed on the photometer and the voltage was raised until the candle power equalled the initial value. Three lamps marked for 108 volts were raised to 111.4 volts and to 112.6 volts to restore them to their initial candle power. Another lamp marked for 110 volts, which had burned 558 hours on the circuit with widely fluctuating voltage, was raised to 120 volts before its candle-power equalled that of its youth. The efficiencies of these lamps at the higher voltage were from one to eight per cent. lower than their original efficiencies. This seems to justify the practice of some engineers who move old lamps to places on the circuit having higher average voltage. To what extent the economical life of a lamp may be extended by raising the voltage from time to time, is a matter that seems worth investigation. In this connection it should be stated that very few of the lamps showed any considerable blackening, so that the loss of light and efficiency with age seem to come more from change in the filament than from absorption by the coating inside the bulb.

tion by the coating inside the bulb.

As a matter of interest, several lamps were gathered from various sources and their candle power measured while dirty with the accumulations of time and after the same were washed off. The light was increased from one to thirty per cent. The following are the tables:

Lamp.	Number	Ca	ndle-p	ower.		Wat	ts.	Watt	s per (	Candle.
	tested.	From.	To.	A verage.	From.	To.	Average.	From.	To.	Average.
· A	.5	18.9	21.0	20	50.3	51.3	50.7	2.45	2.65	2.57
В.	4	21.3	22.7	22	51.1	55.8	53	2.32	2.55	2.42
$^{\circ}$ C	7	15.2	18.7	17	47.3	49.7	49	2.66	3.22	2.92
$\mathbf{D}$	6	17.3	23	20.8	61.3	71.3	66.4	2.87	3.68	3.23
$\mathbf{E}$	6 -	17.3	19,1	18	58.3	60,6	59.1	3.13	3,45	3.29
$\mathbf{F}$	9	15.8	16.8	16.4	50.9	58.2	53	3,12	3.58	3.24
G	6	18.2	20.9	19.2	55.7	57.8	56.6	2.67	3.10	2.95
H	6	14.1	19.9	16.8	53.3	62.7	58.4	3.14	4.10	3,50
Ia	3	14.8	17.4	15.2	53.6	54.4	54	3.12	4.07	3.60
Ib	3	16.6	20.4	19	55.9	61.9	58	2.78	3.35	3.07
Total	55	14 1	23.0	18.3	47.3	71.3	55.8	2.32	4:10	3 10

Initial Measurements-Lamps New.

			Al	TER BUI	RNING 50	Hours				
A B C D E F G	4 4 4 4 7 7	17 20 15.1 17.9 15.5 8.2 18.6	18.6 22.6 18.2 23 20 17 21	17.9 21.4 15.8 21.2 17.3 12.4 19.7	49.6 50.8 45.7 66.6 57.2 47.5 56.2	50 55 50.2 72.1 60.9 58.3 57.9	49.8 53.1 48.5 68.8 58.9 51.4 57	2.67 2.44 2.76 3 3.02 3.14 2.70	2.90 2.53 3.75 3.86 3.71 5.80 3.07	2.78 2.48 3.13 3.28 3.43 4.31 2.91
Total	31	8.2	23.0	17.5	45.7	72.1	55.0	2.44	5.80	3.27

			A	FTER BUI	RNING 10	0 HOURS	l <b>.</b>				_
A B C D E F G	1 4 4 4 4 6	16.4 19.7 11.7 17.2 15.8 10.1 18.4	16.4 21.4 18.2 22.3 20.7 17.7 20.8	16.4 20.5 15.7 20.7 17.7 13.1 19.7	48.6 50.8 45.5 66.4 57.8 49.4 56.1	48.6 54.6 50 72.1 61.1 58.3 67.8	48.6 53.1 45.7 68.7 59.3 51.8 57.2	2.98 2.52 2.75 3.07 2.93 3 2.78	2.98 2.64 3.90 4.04 3.66 5.02 3.06	2.98 2.59 3.13 3.36 3.39 4.09 2.92	
otal		10.1	22,3	17.5	45.5	72.1	55,3	2,52	5.02	3.30	-

Total	27	10.1	22,3	17.5	45.5	72.1	55,3	2.52	5.02	3.30
			A.	FTER BUI	RNING 40	0 nours	•			
B C D E F G	1 3 4 4 5 4	17 14.2 16.4 16 11.3 15.8	17 15.4 19 18 16.5 17.8	17 14.8 18.4 17 13.2	51.3 46.6 65.3 57.4 48.5 55	51.3 49.2 70.2 60.8 58.3 57.2	51.3 48.1 67.5 59 51.4 56.6	3 3.16 3.19 3.36 3.16 3.21	3 3.28 4.18 3.58 4.31 3.62	3 3.25 3.67 3.48 3.95 3.34
Total	21	11.3	19.0	16.0	46.6	70.2	56.5	3.00	4.31	3.54
			Al	TER BUF	NING 60	0 HOURS.				
C	· 3	13 16.2	14 18.8	13.6 17.5	45.9 65.5	49 69.9	47.3 67.2	3.34 3.49	3.60	3.46 3.87

		<del></del> ,	AI	TER BUR	MING	HOURS.			,	
C D F	· 3 4 4	13 16.2 11.4	14 18.8 14.0	13.6 17.5 12.6	45.9 65.5 44	49 69.9 58.3	47.3 67 2 50.1	3.34 3.49 3.41	3.60 4.26 4.28	3.46 3.87 3.99
Total	11	11.4	18.8	14.7	44.0	69.9	55,6	3.34	4.26	3.82
•			Ind	lyldual I	emp De	rformar	100			

Lamp.	Life.		Candle-p	ower.	W	atts per	r Candle.
-		Initial.	Final.	After 500 hours.	Initial.	Final.	After 500 hours.
A1	94	19.1	16.8		2,56	2.93	
$\mathbf{A2}$	93	21	18.6		2.45	2.65	
<b>A3</b>	79	20.6	16.9	l I	2.47	2,95	1
$\mathbf{A4}$	107	18.9	16.4		2.66	2.98	
B1	488	21.8	17.3	17.3†	2.55	3.12	3.12†
B2	330	22,2	16.9		2.38	3.05	
· B3	305	20.6	14.8	i I	2.47	2.96	
B4	347	22.6	13.2		2,32	3.30	<b></b> .
, C1	603	18.7	13	14	2,68	3.60	3.45
C3	883*	18.0	13.4	14.6	2.75	3.62	3.20
C4 -	883*	15.2	12.6	14	3.02	3,60	3.35
D1	883*	21.2	15.5	17.9	3.12	3.90	3.63
D2	883*	21.3	16.4	17.5	3.37	4.22	4
$\mathbf{D3}$	883*	21	15.9	16.3	3.32	4.30	4.26
D4	883*	23	15.8	19.5	2.90	4.08	3.37
<b>E</b> 1	487* .	17.3	17.3	17.3†	3.46	3.42	3.42†
$\mathbf{E}2$	487*	19.1	17.4	17.4†	3.08	3.48	3.48†
$\mathbf{E}_3$	486*	18.6	16.2	16.2†	3, 14	3.51	3.52†
$\mathbf{E}5$	486*	17.5	16.1	16.1†	3.33	3.56	3.56†
$\mathbf{F1}$	462	16.7	12.2		3.12	4	
$\mathbf{F2}$	793*	16.6	13	11.7	3.14	3.73	4.16
F3	793*	16.2	13.1	14.1	3.58	4.23	4.10
$\mathbf{F4}$	793*	16.5	10.8	11.5	3.23	4.40	4.28
$\mathbf{F6}$	595	20	12,9	14.2	2.76	3.42	3.65
$\mathbf{F8}$	40	17.4	8.2		2.98	5.80	
G3	435*	18.2	15.7	15†	3.10	3.65	3.70†
G4	435*	191.	16.1	15†	2.93	3.38	3.60†
G5	435*	20.9	17.1	16.2†	2,67	3.35	3,50†
. G6	435*	19.2	17.4	16.5†	3.02	3.27	3.40†

Note.—Lamps marked \* were in fair condition at close of test. † Figures estimated from curves.

#### ISLE OF MAN ELECTRIC TRAM-WAYS—WATER POWER UTILIZA-TION PLANT.\*

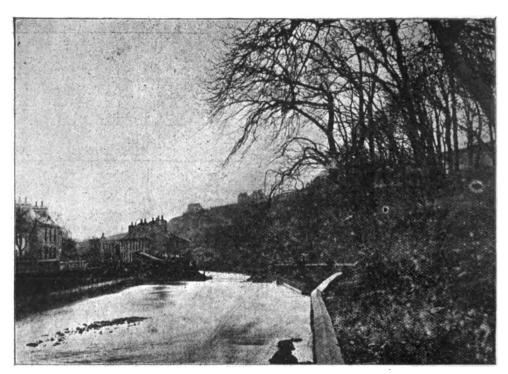
The Isle of Man Tramways & Electric Power Company have recently put into operation a water power plant in connection with their Douglas-Laxey and Ramsey electric lines; and the successful results obtained have enabled them to shut down their steam plant entirely, the entire line, 18 miles in length, being worked solely by water power. The line in the summer time is used for tourist traffic, when the load on the several power stations reaches about 2,200 hp., but for about seven months each year the line is dependent on the local passenger and freight traffic, which is comparatively light. The water power scheme, which was originated by Mr. Alexander Bruce, J. P., the chairman of the company, was designed by Mr. J. Shaw, A.M.I.E.E., the general manager and engineer, to work the line during these seven months, when the traffic is considerably reduced, and when it is necessary as far as possible to keep down the expenditure. As all the coal used by the company has to be imported from South Wales, the financial saving will be considerable.

The Laxey River, which is seven miles from the Douglas and 11 miles from the Ramsey termini, has been utilized for obtaining the requisite power. The water has been taken after it leaves the "washing floors" of the Great Laxey Lead Mines, and the tail water is discharged direct into Laxev harbor, the total fall being 41 ft., which, after deducting pipe losses, etc., allows a working fall of 38 ft. As part of the water is used for ore-washing purposes at the Snaefell and Great Laxev Mines, it contains an immense quantity of sand, and special precautions have been taken to prevent this from reaching the turbines. The head work consists of a concrete weir 40 ft. long by 4 ft. 6 in. high, built across the river. At one end of the weir are two masonry archways 5 ft. wide by 5 ft. high, each fitted with a sluice gate and the necessary gear for raising and lowering the gates. The two gates are separated from the river by means of an iron grating 55 ft. long by 5 ft. 6 in. high. During floods a large amount of debris is washed down the river, and the gratings protect the gates from being blocked. Inside the gratings is a large settling tank for the sand, the tank being emptied by opening the gate nearest the weir, which is used as a bye-pass for flushing purposes. The other gate is at the commencement of the head race, which consists of 826 ft. of trench 5 ft. wide, followed by 474 ft. of trench 3 ft. 6 in. wide, the depth of each being 4 ft. 6 in. The first of these two sections was made larger in area, to allow the water to travel slowly and settle any sand which might have passed through the first settling tank. At the end of the larger section of race another settling tank has been formed by dropping the bottom of the trench 6 in. for a distance of 50 ft., and providing it with a 12 in. flushing valve. At the end of the second section of race is built a masonry head box 8 ft. by 11 ft. by 7 ft. 9 in. deep, from which the water is conveyed to the turbines by means of 820 ft. of steel pipes 3 ft. diameter. The head box has also been built to act as a settling tank, thus preventing any sand from entering the pipes. An overflow weir 20 ft. long has been built about half way along the race, the surplus water being conducted to the river through an underground conduit. Owing to the bad nature of the ground, the whole of the head race has been constructed of concrete, with the exception of one short length built of masonry. The pipe line, which had to be kept several feet above the ground, is supported on masonry piers. The pipes are made up of in. steel plates with double-riveted seams, and are fixed in 15 ft. lengths. The joints are made with Kimberley collars run in with lead and well caulked.

The tail race is 624 ft. in length, 10 ft. wide, and 13 ft. 3 in. below the floor of the turbine house, and terminates in Laxey harbor. The turbine house is 1,100 ft. away from one of the company's steam power stations, and is a stone building 30 ft. long by 15 ft. wide by 12 ft. high. The fall from the level of the weir to the center of the turbines is 26 ft., the remaining 15 ft. fall being obtained by means of draft tubes. The turbines are of the "Victor" horizontal type, and consist of two independent 12 in. turbines in one casing with the shafts direct coupled, so that, when there is only a small

the steam station. They comprise one generator panel, together with automatic switch, ammeter, voltmeter, positive and negative switches, shunt regulating switch, starting switch and resistance to work the generator as a motor for driving the booster when the water is low, and a recording wattmeter. The booster panel contains switches for controlling a motor driven booster in the steam station, and also the switches for controlling the turbine booster-viz., positive and negative switches, voltmeter, ammeter, shunt regulating switch, recording wattmeter, and change-over switches to connect either the turbine booster or motor booster to any of three feeders. Adjoining the generator panel is a small panel for controlling in either direction the two 1 hp. motors for regulating the turbines. A small pipe has been carried from the head race, and is attached to a gauge glass fixed in a prominent position near the switchboard, so that the attendant can see the height of the water in the head race.

The turbine plant is worked in connection



ISLE OF MAN ELECTRIC RAILWAY. VIEW ABOVE WEIR, SHOWING TOP WATER INTAKE.

amount of water available, one turbine will be used, thus enabling the plant to be worked at its best efficiency. The turbines will develop 140 hp., at a speed of 720 revolutions per minute.

The electric generating plant consists of a combined bipolar dynamo and booster, the generator having an output of 160 amperes at 520 volts and the booster 160 amperes at from 100 to 200 volts. The generator and booster are coupled to the turbine by means of a friction clutch, which permits of the plant being used as an ordinary motor driven booster in the summer time when the river is very low. The turbines, generator and booster are provided with self-lubricating bearings, and are capable of maintaining long continuous runs without heating. The mains from the generator and booster and the regulating wires are carried overhead to the steam power station previously referred to, from which the turbine plant is entirely controlled. Two Lundell & hp. motors, driven from a small storage battery, are used for opening and closing the turbine regulators. The switch panels for the generator and booster are attached to the main switchboard in

with three battery sub-stations, each containing 250 cells of the chloride "R" type, one at Laxey, at the foot of the Snaefell mountain railway, and the other two about five miles on each side, all three stations being worked in When the cars are taking current parallel. the turbine generator is assisting the batteries, but when the cars are descending the grades or standing, the generator is charging the batteries. During the night time, when the cars are not running, the booster is connected in series with the generator, and the batteries are in turn charged at a heavy rate and at a high voltage through the underground feeders. This enables a full load to be maintained continuously on the turbines. The Isle of Man Tramways & Electric Power Co. were the first in the United Kingdom to use storage battery substations for traction purposes, and they find these have proved exceedingly useful for working a long line with a minimum amount of

The turbine plant described above has just completed a 240 hours continuous test, during which it maintained a steady load varying from

<sup>•</sup> From the "Electrician," London.

three-fourths to full load; and although the turbines are not provided with any governor, it was not once necessary to alter the regulation.

The turbines and pipes have been supplied by Mr. F. Nell, of Queen Victoria street, London, and the generator and booster by the Electric Construction Company, of Wolverhampton. The construction of the weir, water courses, and buildings, and the erection of the plant were carried out by the company's staff under the superintendence of Mr. J. Shaw, general manager and engineer, to whom we are indebted and our thanks are tendered for the illustrations and particulars of this unusually interesting example of water power utilization for electric supply.

#### WIRELESS TELEGRAPHY.

#### The Guarini Automatic Repeater.

BY EMILE GUARINI-FORESIO.

[Translated for Electricity from a paper presented at a recent meeting of the Belgium Electric Association.]

As a complete innovation, wireless telegraphy after three years of incessant efforts by Marconi and other physicists of various countries is just entering the field of practical application.

Communications have lately been established in England by his method through a distance of about 140 kilometers, and there is a certainty that more perfect modifications will increase this working distance.

But there will always be limits in direct transmission as there are in ordinary telegraphy, or relays must be used to repeat the signals automatically, and transmit them with renewed energy to the next station.

We are now interested in solving this last problem by the invention of a repeater, which, for wireless telegraphy, subserves the same purpose as the relay in ordinary telegraphy.

Our apparatus is placed between extreme stations to receive the enfeebled radiations, and repeat them with the same periodicity, and with greater energy.

The mechanism and its functions are quite simple. The apparatus acts at first as a receiver, and secondly as an automatic transmitter, and forms at the same time a combination of these two elements. Again we find repeated the story of Columbus and the egg; it is all in knowing how, for naturally in providing a convenient number of repeaters between two stations, however far apart they may be, the problem of wireless telegraphy is solved.

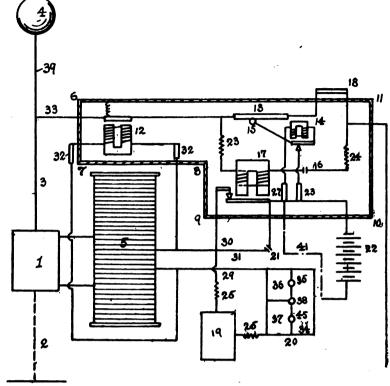
The principle of our repeater, that is, the combination of a receiver and a transmitter, is applicable to numerous other wireless telegraph systems, such as the luminous, and also sound waves, ultra-violet rays, etc. In this sense it has many useful applications, and above all others it is applicable to the Marconi system, and in this application it gives the best results.

Referring to Fig. 1, 1 is the oscillator with a ground connection below, and connected by conductor 3 to the aerial spherical conductor 4, or of any other conformation having great electrostatic capacity.

The Rhumkorf coil, 5, feeds the oscillator. Within a soft iron box, 6, 7, 8, 9, 10, 11, are enclosed an electromagnet, 12, which breaks the circuit in wire 3 and the sensitive tube, 13, each time the oscillator operates without interfering with it. The electric motor, 14, operates a small hammer, 15, which strikes against the

tube, 13, and is energized by a local battery 16; a relay, 17, and a needle galvanometer 18, shows when the apparatus is in use. Outside the metal box is a Morse instrument, 19; 20 is a three-way switch, 21 an operative key, and 22 is a source of electric energy; 23, 24, 25, 26, 27,

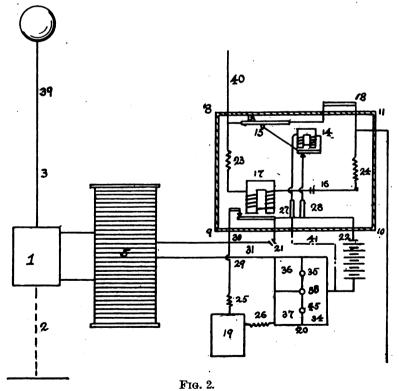
receiver, or as a relay. As a transmitter, the circuit containing the battery, 22, is closed by means of the key, 21, connecting the primary of the coil, 5. The secondary circuit, comprising the resistance, 32, electromagnet, 12, and the circuit of the motor, 14 (in this case when



F1G. 1.

28 and 32 are resistances. The conductor, 29, is connected by 30 with the conductor 31; to change the direction of the current passing through electromotor 14, we accomplished it by connecting 41 of the motor circuit to the

the connection indicated in 41 is employed the motor 14 is always in operation, and the small hammer is constantly striking the sensitive tube 13). In this instance the plate, 34, of the switch is connected with the plate, 36, by plac-



conductor coming from the battery to the switch 20,

In place of one vertical bar we can use two; one, 39, in communication with the oscillator 1, and the other, 40, connected with coherer 13, and thus suppress the electromagnet, 12 (Fig. 2).

The repeater can operate as a transmitter,

ing the contact key in the hole, 35. We see from these connections that immediately after the coherer has operated, that it is always in a sensitive condition, and resumes that condition automatically through the action of the hammer, 15.

When the apparatus is used as a receiver, the electric waves arrive through the sphere 4, the



bar 39, and the wire 33, and acts on the sensitive tube 13, in identically the same way as in the Marconi receiver. It is then necessary to connect the two plates, 34 and 37, by placing the connecting plug in the hole 45.

: As a repeater the plate 34 and 36 are connected. The distant station sends out a wave of greater or less duration, and when this wave acts on the sensitive tube at an intermediate station the relay, 17, energizes its armature, and closes the circuit of the oscillator coil, and at the same time that the bar 39 is traversed by an intense oscillating current, the hammer 15 strikes the sensitive tube 13, and consequently makes it ready to receive the next wave which arrives. If at that instant the transmitter of the distant station ceases to act, the repeater will then have sent out a current of short duration, which will be registered at the distant receiving station by the Morse apparatus as a dot. But if the wave from the transmitting station continues, the sensitive tube will operate again, which at the distant receiving station will be registered as another dot. We thus see that the repeater sends out a succession of electric impulses whose number depends on the duration of the wave from the transmitting 'station. These effects of the current are registered as a succession of points at the receiving station as in the Marconi apparatus, following the frequency with which they succeed each other, and reproducing in the Morse apparatus lines of variable lengths. Again, if the conductor 34 is connected to 37, and at the same time with conductor 36 by means of the .plug placed in the hole 38, this simple arrangement permits of the registration of transmitted or repeated signals. The electromagnet, the relays and the coherer are enclosed in a soft iron box to prevent these parts. from being influenced by the magnetic field of the induction coil, which is necessarily near the other parts to secure the best results.

The repeater which we have just described, whatever its arrangement, is admirably designed as a repeater for moving stations, such as the establishment of communication between ships, in which one of them serves as an intermediate station.

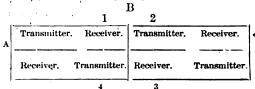
But the arrangements as represented in Figs. 1 and 2 are not adapted to solve the problem of wireless telegraphy at any distance, for let us suppose we have two outer stations, A and B, and two relay stations, 1 and 2, as shown below:

And again let us suppose that the station A is the one which is sending, and B is the receiving station. The waves sent from station A influence the coherer of the intermediate station 1, and the latter in its turn acts on the coherer of the intermediate station 2, and at the same time that the waves sent out from station 2 actuate the coherer of the last station B, it will also influence the coherer of the intermediate station 1, perhaps at the same time that station A is sending out other signals, and the result would be confusion. Theoretically with the arrangement shown in Figs. 1 and 2 a single intermediate station is allowable, but practically we can use an indefinite number, especially if we consider these repeaters, in the various stations, as acting almost instantaneously.

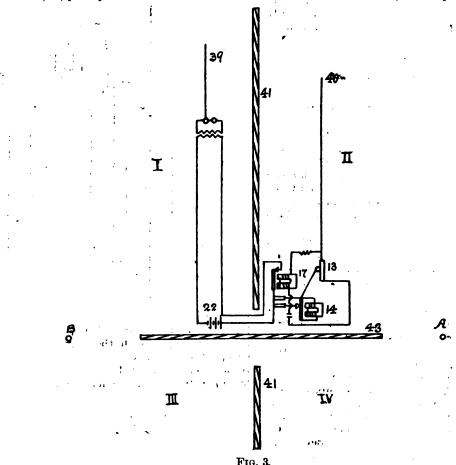
We may then arrange an apparatus as shown in Fig. 3; we separate the receiver from the transmitter by a metallic partition, 41; the receiver should be on the side toward the distant transmitting station, and the transmitter on the side next to the distant receiving station.

The partition might be of any substance which will arrest the electric radiation, prevent the radiation of the intermediate transmitting station from returning to the extreme distant transmitter, or to that of a preceding intermediate station, in those instances where there are several and at the same time, when necessary, to prevent the receiver of an intermediate station, wherever it may be, from being influenced by these same radiations. The partition, 41, perhaps could be a reflector which

the two extreme stations, it becomes possible to transmit in opposite directions at the s me time by the following diagram:



A and C are the two distant stations, and B is an intermediate one. The signals sent by the transmitter of station  $\Lambda$ , and repeated by the



would reflect the radiation from the repeating transmitter to the next following receiving station.

The arrangement of parts shown in I, II (Fig. 3), are such as to receive from A, and transmit the electric radiations to B; in order to receive from B and transmit to A, we would employ a second apparatus, entirely distinct from the first, whose parts as mentioned would likewise be separated by a partition 41; in this second apparatus the receiver would be in III and the transmitter in IV, and the two combinations would be separated by another partition, 43, which would permit the operation of any one of the two combinations, that in I and II, or that in III and IV, according to which station A or B is transmitting.

It is immaterial whether we employ partitions, or reflectors, a single combination can serve for communication in either case by using a switch which will place the oscillator in circuit with the wire in I, or in IV, according to which station A or B is transmitting but in this case the one who does the switching should know which station is sending; there being a single Branly tube, each time an intermediate station is in operation, the sending station should know which is transmitting, and this would not be practical.

By metallic partitions, or analogous means separating the sender and the the receiver, also relay 1-2 of station B, are registere l by the receiver of station C at the same time that the signals sent by the transmitter of station C are relayed by the relay 3-4 of station B, or registered by the receiver of station A.

The results secured by the arrangement of parts shown in Fig. 1 have demonstrated that the interrupter, 12, requires a certain amount of attention, which could not be given in case the apparatus is placed on buoys anchored in mid ocean for communication between islands or distant continents; then we must employ an arrangement shown in Fig. 2 where the electromagnet, 12, which has no other functions than that of feeding the single receiving bar, 39, and which suppresses the transmission of signals.

To make the apparatus wholly automatic (without need of personal attention) it is preferable to use dry batteries, or other kinds that will last a long time without being renewed, and likewise for the same reason it is preferable to use the Blondel coherer, which is the one having the longest life and is recuperative.

It is generally believed by wireless telegraph electricians that when these radiations encounter a metallic surface they go around instead of being arrested; this belief is caused by the fact that sometimes when a coherer is placed behind a metallic surface it will still operate.



We have always held and now maintain that a metallic surface is an unsurmountable obstacle to electric radiations; although we admit the case just cited, and to our mind this is the explanation.

Let us consider Fig. 3. When the oscillator operates, the wire 39 causes induced currents in the metallic surface, 41; the conductor 41 then becomes a new center of radiation, but of a minimum intensity, from the induced current being less, or because part of the induced current is transformed into heat. Radiations from conductor 41 are too feeble, especially if we employ a metallic separation, but above all when this conductor is connected to earth to enable the current to return to station A or to a preceding intermediate station, should there be several. The coherer placed in II is then in use; then as to what follows we have explained does not prevent the action of our apparatus, because the same instant it operates it is decohered.

But there are instances, such as when we wish to transmit messages in opposite directions at the same time, when it is absolutely necessary that the receiver be not acted on by the transmitter of the same station. It is easy to obtain this result. All there remains to do is to separate these two pieces of apparatus by a plain metallic surface, and operate at right angles; in this case there are no radiations except upon the surface exposed to them as in the Hertz reflector.

Wireless telegraphy becomes then immediately practicable for all distances and under all conditions.

Thanks to this apparatus, it becomes henceforth possible to establish true lines of wireless telegraph "quick and sure."

Here are some of the immediate possible applications of the repeater: communication between islands, between distant continents, between large cities, between meteorological stations, communication between two trains in motion with a repeater placed in the railway stations, communication between railway stations, and also between fortified points along the sea coast.

We could establish telegraphic communication between London and New York, by placing a convenient number of repeaters on the Bermuda Islands, the Azores and upon buoys at sea, in Portugal, Spain, France, etc.

If we place repeaters with their spires in relatively vertical positions upon floating buoys anchored at convenient distances apart at sea, any vessel finding itself within working distance could communicate with any one on any subject it chooses. One vessel could telegraph to any other vessel at a great distance, which is within the range of the electric waves that can influence its coherer from one of these floating repeaters, and our system would be useful in securing help at sea when a ship is in danger.

Our apparatus can register the messages which it repeats, or transmits, and a ship which is too far away from shore to receive messages, or too far away from a vessel in distress, could receive messages by going to the floating recording instrument to read them.

There is no fear of a confusion of signals, if the apparatus is used as we have proposed, for in the circuit of the coherer (which is always sensitive whether it acts as a transmitter, receiver or as a repeater) there is an indicator which tells by its needle if the apparatus is being used. The deviations of the needle will indicate if the line is in use, and we have only to wait until the needle is at rest to know when to send a message.

The apparatus will find immediate use in new countries where telegraph lines do not exist, and an expedition to unexplored regions could keep in touch with the point of departure.

Finally, as M. Ernest Gerard, chief engineer to the Minister of Posts and Telegraphs, has remarked in finishing an address on this sub-ect, before the Belgium Electric Association, "The applications are of such a nature, and of such great importance that the present condition of things would be wholly changed."

#### OUR PARIS LETTER.

(Special Correspondence of Electricity.)

# The Electric Railroad Between Fayet and Chamouni.

The project of building an electric railroad to the top of Mont Blanc, which is intended finally to connect with the road from Fayet to Chamouni, has already been mentioned in ELECTRICITY. We now take up this subject because this road is very interesting, viewed from the construction standpoint. It is in fact the first time that a great French railroad company has attempted to build and operate an electric narrow-gauge railroad. It is being undertaken by the Paris-Lyons & Mediterranean Railway Company. The road at present terminates atiMont Blanc, with the intention of extending to the summit later on. The present terminal station will be at Fayet Saint Gervais (580 meters, high) and the track will be further extented to Chamouni which is 1,007 meters above the sea level. The power will be furnished by the Arve River from four different water power plants constructed Letween Saint Gervais and Chamouni. The current will be carried on a lateral rail and will be taken up by contact brushes, and every car will be furnished with a motor. On the steep grades a central rail will be added which will ne used in connection with a supplementary brake. One of the power plants has been con.pleted at Chedde, about three miles from the Fayet station. The width of the track is one meter throughout the entire line. From the starting point the track commences to rise gradually and terminates at Chedde, at an elevation of about 597 meters. Passing this station there is a grade of 2 per cent., followed by another one of 9 per cent, for a distance of two kilometers; this last grade is the steepest one as none of the others exceed 7 to 8 per cent.

# The Electric Railroau from Pierrefitte to Canterets.

Little information is at present to be obtained from this road as the track is not yet entirely completed. This is a connecting road in the Pyrenees, between the main line of the Southern Railway and the watering place of Cauterets, so famous on account of its sulphurous water. From present information the detail in regard to cars and the electric plants will be about the same as in the Chamouni construction. This line has been in operation about two months, the track is 11 kilometers long and rises to a height of 1,000 meters, and the gauge is one meter. The ascents are made by ordinary traction, but all the cars are furnished with motors. There are 25 cars with 52 seats each, with a passage way through the penter, while two compartments at each and give access to the platforms. Each car is

mounted on four bogie trucks; each one of the latter is operated by two motors of 30 amperes and 600 volts, giving an 18-kilowatt capacity, or 25 horse-nower at 450 revolutions per minute. There are three styles of brakes in use—a hand brake, by means of which shoes are applied to all of the eight wheels; a flat brake of tempered steel which operates by friction on the rails. while thirdly, the motors can be made to run as generators. The motive power is supplied from a sluice-way from the Cauterets torrent, which forms a series of water-falls, and after a subterranean run of 800 meters arrives at two coupled steel-plate pipes of 65 cm. diameter, which carry the water under a 69 meter head, giving 1,300 hp, to the main station erected at Calypso, about midway between Pierrefitte and Cauterets. This plant has four waterwheels of 300 hp. each, operating 8 dynamos. Another small wheel operates the exciters. The current is generated at a tension of 750 volts and is conducted by overhead wires to the trolley cars. All stations are illuminated by electric lights and a telephone line connects all the stopping places along the entire route.

# The Mountain Electric Railroad up Mount Dore.

If we add the description of the interesting construction recently completed up . Moun Dore by Messrs. Guitton & Co., the French rep resentatives of the Oerlikon Company of Zurich, Switzerland, we think we have reviewed all the latest mountain railways operated by electric power in France. The power for this line is secured from the Dordogne River and transmitted by the three-phase system. This line allows suffering humanity to enjoy a mountain-air cure. It connects the city with an elevated plain having a forest of fir-trees. The river can supply 600 liters of water per second, a gate and a sluice-way conducts the water to the plant, which is situated at a distance of 740 meters, where the fall attains a height of 31.50 meters. The plant has an underground passage for the pipes, and a water reservoir: the ground floor contains the water-wheels and their accessories. The turbine is furnished by the Lremer Negret Company of Grenoble, and is of the helico-centri-. petal type of horizontal style, and gives 180 hp. at 500 revolutions per minute, driving directly. by means of elastic coupling, a three-phase current alternator with a rotary iron field of the Oerlikon system. At a speed of 500 revolutions the alternator produces 138 kilowatts at 2,000 volts per phase, corresponding to a total of 3,600 volts at a frequency of 50 periods; per second. Excitation is furnished by a small bipolar dynamo of 600 watts at 50 volts, mounted directly on the alternator shaft. To avoid too much variation of power, which varies from 0 to 80 hp., a balance wheel of 1,800 kilograms is placed between the alternator and the turbine. An automatic speed ! regulator operating a cylindrical slide-valve is also attached to the apparatus. On the switchboard there is a transformer for the purpose of reducing the potential in order to permit the reading of the voltmeter and to secure station; illumination. There are also voltmeters and amperemeters of high tension and a bipolar switch. The three outgoing lines are fitted with condensers. There are three bare wires in the transmission line: they are of silicious bronze of 4 mm. diameter resting on double bell china insulators and wooden posts. The electric energy is sent to a sub-station on the summit, where an electric motor is placed to op-

erate the cable-driving drum. This motor is of the three-phase synchronous current type with a rotary field of 12 poles and 50 alternations per second and makes 490 revolutions per minute. its power being equal to 90 hp. The power is transmitted to the motor drum by means of two shafts carrying pinions and the necessary attachments. The reversing is done by commutating the current in two of the three windings of the magnet. The cable pulling the cars which winds off on pulleys operated by the moter drum has a diameter of 33 mm., and weighs 3.9 kilograms per linear meter. The track gauge is one meter, and is single track, with the exception of a run of 38 meters at the car crossings. These cars weigh 5,035 kilograms, and are attached to both ends of the cable. This is the first electric cable railroad constructed in France.

#### LEGAL NOTES.

Answer was made recently to Mrs. Mary T. Leiter, who is seeking to have a receiver appointed for the Metropolitan Street Railway Company of Washington, D. C. Mrs. Leiter said in her bill of complaint that the recent street railway consolidation deal, by which the Metropolitan lines became practically one with several suburban roads under the name of the "Washington Traction & Electrical Company," has detracted from the value of her 2,700 shares of the Metropolitan Company, as well as from the \$27,000 worth of certificates of indebtedness which she holds from that company. She made the directors of the new company defendants in the suit, charging them with losing sight of the interests of the Metropolitan Company in their desire to advance the interests of the new concern. The reply, besides denying many of the minor allereply, besides denying many of the minor ane-gations of Mrs. Leiter, recites that at the time the consolidation was affected an offer was made to buy Mrs. Leiter's stock for \$230 a share, which, it is claimed, was the highest price the stock had ever sold for. This offer was refused, Mrs. Leiter claiming \$400. The reply avers that Mrs. Leiter brought the suit simply to compel the purchase of her shares at an exorbitant price.

Ruling was lately made in the United States Circuit Court of Appeals of Chicago, Ill., by Judges Jenkins, Wood and Bunn, that a creditor who within four months of his debtors' bankruptcy has innocently received a payment on his debt cannot be permitted to prove his debt in the bankruptcy proceedings nor receive from the estate of the bankrupt a dividend thereon without surrendering the preference allowed. The ruling is said to establish a new precedent for creditors under the National bankruptcy law. The decision was handed down in the appeal of the Columbus Electric Company against Charles H. Worden, trustee of the Fort Wayne Electric Corporation.

The Van Choate Electric Company, a Maine corporation, with principal offices in Boston, Mass., and a plant at Foxboro, was placed in the hands of three receivers, E. R. Price, F. W. Hartwell and T. P. Blake, by Judge Colt in the U. S. Circuit Court a short time ago. The company has a capitalization of \$6,000,000. The shareholders are numerous and the stock is frequently quoted in the financial world.

#### The New York Electrical Society-203d Meeting.

The 203d meeting of the New York Electrical Society will be held at the College of the City of New York, Twenty-third street and Lexington avenue, on March 2 at 8 P. M. A. R. Ledoux, M.S., Ph. D., will lecture on "Copper from the Ore to the Wire Bar."

#### PERSONAL MENTION.

Mr. C. L. Edgar, vice-president of the Edison Electric Illuminating Company of Boston, Mass., has been elevated to the presidency, succeeding the late Jacob C. Rogers. Director Walter C. Baylies was elected vice-president to succeed Mr. Edgar.

Mr. Howard C. Lewis, of Schenectady, N. Y., was recently elected president of the People's Electric Light Company, to succeed the late S. Dana Greene.

Mr. E. H. Rollins, who has been superintendent of the Central Massachusetts Electric Company of Palmer since its incorporation, will remove to Hartford, Conn., about March 1, where he will be engaged in the electrical business.

Mr. Charles Kent, of Ogdensburg, N. Y., has recently een elected manager and superintendent of the Canton (N. Y.) Electric Light & Power Company.

Mr. J. H. Witbeck was recently elected president and treasurer of the Chicago General Railway Company.

#### INCORPORATIONS.

The Consolidated Electric Company, Camden, N. J.- to do a general electrical business. Capital stock, \$10,000.

The Bunnell Telegraphic & Electrical Company, New York City-to manufacture telegraphic supplies. Capital stock, \$200,000. Directors: Mary T. Bunnell and Dewitt C. Bunnell, Brooklyn; F. R. Green, Fredonia; Charles E. Merritt and Albert J. Wise, New York City,

The Columbus, London & Springfield Railway Company, Columbus, O.-to operate a passenger and freight electric road, also a telegraphic service, and to furnish electricity for power, lighting and heating to the towns along the route. Capital stock, \$1,000,000. Incorporators: John G. Webb, John M. Good, Hart F. Fisher, Emmet Tompkins and Fletcher S. Penfield.

The Guernsey Incandescent Light Company, St. Louis, Mo. -to do a general electrical business. Capital stock, \$100,000. Shareholders: David W. Guernsey, Sim T. Price, Joseph G. Branch and Charles W. Barstow, Jr.

The Lockport and Newfane Power & Supply Company, Albany, N. Y.- to develop and employ hydraulic and electrical power and supply it to the citizens of Niagara County. Capital stock, \$500,000. Incorporators: Willard T. Ransom, Henry I. Pierce, John A. Merritt and Harry L. Ransom.

The Kinston Electric Light Company, Kinston, N. C .-- to supply electric light and power. Capital stock, \$10,000. Incorporators: B. W. Cannady, S. H. Abbott, J. W. Granger. L. Harvey, all of Kinston.

The Athena Light & Power Company, Athena, Ore,-to operate an electric light plant. Capital stock, \$30,000. Incorporators: T. J. Kirk, C. A. Barrett, Joseph France, H. C. Adams and J. W. Smith.

The Municipal Light, Heat & Power Company, Hoboken, N. J. - to furnish electricity, heat and compressed air. Capital stock, \$300,000. Incorporators: J. Bruning, of Hoboken; P. H. Wallenstein, J. H. Walsh, both of New York.

#### COMMERCIAL PARAGRAPHS.

The Emerson Electric Manufacturing Company of St. Louis, Mo., desires to announce that it has opened a New York office at 136 Liberty street, which is in charge of an officer of the company and where a large stock of regular motors will be carried. This will permit of the trade in this vicinity being supplied with a minimum amount of delay.

The Cling-Surface Mfg. Company of Buffalo N. Y., has just been incorporated under the laws of the State of New York, retaining the same name as heretofore, with Albert B. Young, as president and general manager, and Wm. D. Young, vice-president and secretary. The past year has been the most prosperous in the history of the company and the demand for Cling-Surface they report to be increasing steadily. They have now three branches, one each in Boston, New York and Chicago, with others just opening in St. Louis and New Orleans, while the well known importing house of W. J. Moxham & Co. of Sidney, Australia, has ordered a large shipment of Cling-Surface with the exclusive right to handle it in Australia.

#### ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FORFIGN PATENTS. at 502 and 504 Broadway (Room 1204), New York City also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as print d publications containing all informaregarding the cost of United States and Foreign Patents Trade Marks, Designs, etc., will be given free upon application

by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon pay-

ment of ten cents. When ordering give name, date and tite of invention wanted.

#### LETTERS PATENT ISSUED FEBRUARY 6, 1900

#### ELECTRIC RAILWAYS AND APPLIANCES.

642,570, Underground Electric Railway, William J. Baumer and Henry Emmel, Johnstown, Pa. Filed Oct. 5,

mer and Henry Emmel, Johnstown, Pa. Fried Oct. 5, 1899.
642,697. Electrical Track for Receptacles. Charles Hutchinson, Arlington, N. J. Filed Nov. 14, 1898.
642,737. Electric Railway. Edonard Bonnet, Jules Paufique, and Georges, Liniere, Lyons, France. Filed July 11, 1899.

#### ELECTRIC LIGHTS AND APPLIANCES.

ELECTRIC LIGHTS AND APPLIANCES,
642.623. Hanger for Electric Lamps, William F. Murphy,
10wa City, 10wa. Filed May 15, 1899.
642.627. Electric-Lighting System. Amand C. M. Prucker,
Hanover, Germany, assignor to the Siemens & Halske
Electric Company of America, Chicago, Ill. Filed Sept.
2, 1899.
642,648. Electric-Lighting Device. George W. Van Duzer,
Hackettstown, N. J., assignor of one-half to M. Munson
Scaring, Pover, N. J. Filed April 27, 1899.
642,825. Socket for Incandescent Electric Lamps, William
E. A. M. Oetting, Pittsburg, Pa. Filed Sept 16, 1899.
642,825. Carbon for Electric Are Lights, John T. Robinson,
New York City, assignor of one-fourth to James H. Ferguson, same place. Filed Aug. 2, 1898.
642,995. Electric Connecting Device for Lamp Holders,
Wall-Plugs, etc. Charles L. R. E. Menges, The Hague,
Netherlands. Filed March 14, 1898.
643,995. Magneto Electric Lighting Apparatus for Bicycles,
Sidney L. Holdredge, Boston, Mass., assignor, by mesne
assignments, to the Dowd Electrical Company, New York
City. Filed June 30, 1898.

ELECTRICAL MACHINERY AND APPARATUS.

#### ELECTRICAL MACHINERY AND APPARATUS.

ELECTRICAL MACHINERY AND APPARATUS,
642,559. Dynamo-Driving Mechanism. Robert M. Dixon,
East Orange, N. J. Filed Sept. 14, 1898.
642,559. Dynamo Electric Machine. Henry Geisenhoner,
Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Nov. 7, 1988.
642,645. Dynamo Electric Machine. Christian W. Kragh,
Madison, Wis., assignor to the Northern Electrical Manufacturing Company, same place. Filed Sept. 11, 1899.
642,833. Driving Mechanism for Dynamos, John L. Creveling,
New York City. Filed Jan. 24, 1899.
642,839. Controlling Means for Spark-Generators Homer
N. Motsinger, Pendleton, Ind., assignor of one half to
Newell H. Motsinger, Shoals, Ind. Filed April 21, 1899.
642,932. Electric Current Controlling Mechanism. Charles
W. Squires and James B. Squires, Springfield, Mass.
Filed March 15, 1899.
643,066. Alternating Current Motor, Walter Langdon-Davies,
London, England, assignor to the Langdon-Davies,
London, England, assignor to the Langdon-Davies,
London, England, assignor to the Langdon-Davies Electric Motor Company, Limited, same place. Filed May 22,
1899.

1899.
643,087. Electric Generator for Sparking Apparatus of Gas-Engines. Daniel Drawbangh, Eberly's Mills, Pa. assignor of three-fourths to David B. Hoffer, Lebanon, Jacob E. Shettle, Shepherdstown, and Henry B. Eberly, Shiremanstown, Pa. Filed May 6, 1899.
643,083. Electric Motor. John C. Henry, Westfield, N. J. Filed Aug. 27, 1892.

#### TELEPHONES AND TELEPHONE APPARATUS.

42,849. Telephone-Switchboard Ernst E Yaxley, Chicago, Ill., assignor to W. T. Blaine, same place. Filed July 26, 1893. Renewed Aug. 5, 1899.
642,880. Connection Register for Telephone-Lines. Charles E. Scribner, Chicago. Ill., assignor to the Western Electric Company, same place. Filed Feb 14, 1898.
642,932. Telephonic Instrument. Frederick A. Swan, Boston, Mass. Filed May 3, 1899.
642,932. Mouthpiece for Telephone Transmitters, etc. George B. Hart and Francis W. Milligan, Rochester, N. Y. Filed March 7, 1899.

#### MISCELLANEOUS.

Apparatus for Electrically Transmitting Orders or gnals. Alfred U. Alcock, London, England. Filed n. 6, 1899.

Signals, Affred U. Alcock, London, England. Filed Jan 6, 1889.
642.643. Means for Generating Ozone, Charles G. Arm-strong and William D. Neel, Chicago, Ill. Filed March 12, 1898.

808. Electrical Recording Apparatus. Hugh L. Cal-ar, Montreal, Canada. Filed Feb. 14, 1838.

strong and William D. Neel, Chicago, Ill. Filed March 12, 1848.

642,674. Electrical Recording Apparatus. Hugh L. Callendar, Montreal, Canada. Filed Feb. 14, 1858.

642,738. Electric Cable for High-Tension Currents. Chas. Borel, Lyons, Frames. Filed Feb. 13, 1888.

642,738. Commutator for Electric Motors or Generators. Sydney Evershed, London, England, assignor to himself and the Evershed & Vignoles, Limited, same place. Filed Sept. 15, 1859.

642,849. Electrically Igniting Lamps and Liquid-Fuel-Burning Devices. Robert Schreiber, Berlin, Germany. Filed July 30, 1838.

642,849. Railway Signal Mechanism. Samuel L. Neely, Pierron, Ill. Filed May 10, 1899.

642,849. Electrical Massage Instrument. Edmund T. Otto, Jersey City, N. J., assignor to Whitall, Tatum & Co.: New York City. Filed Nov. 27, 1899.

642,859. System of Electrical Distribution. Henry P. White, Kalamazoo; Mich., assignor of three-fourths to Charles D. Fuller, same place. Filed Sept. 26, 1898.

642,933. Electric-Alarm Try-Cock. Stephen M. Mathews, Toronto, Canada. Filed April 41, 1899.

642,933. Electricity Separation of Zine from Zine Oxid, Oscar J. Steinhart, Julius L. F. Vogel, and Henry E. Fry, London. England: said Steinhart and Vogel assignors said Fry. Filed April 10,1849.

642,938. Electric Battery, Henry Blumenberg, Jr., and Frederick C. Overbury, New York City. Filed March 27, 1899.

27, 1899. 643,002. Electric Ignit r for Explosive-Engines. Willis J. Perkins and Carl H. Blomstrom, Grand Rapids, Mich.; said Blomstrom assignor to said Perkins. Filed Dec. 9, 1897.

1897.
643,042. Process of Producing Material Suitable for Electric Insulation or other Purposes. Arthur Smith, London, England. Filed Aug. 14, 188.9.
643-048. Utilization of Hertzian or Similar Radiations and Apparatus Therefor. London, H. Walter, London, England. Filed March 6, 1899.



### GENERAL NEWS.

#### What is Going On in the Electrical World.

#### LIGHTING.

Ada, Minn.—Bid: will be received until March 1 for the erection of a new electric light plant in this village. Address F. M. Carkins.

Alcester, S D - The citizens of this place are agi ating the question of building an electric light plant

Auburn, Neb.—The necessity of an electric light plant in this city is being agicated by a number of citi-

Beaver Dam, Wis.-An electric light plant will soon be built here.

Beeville, Tex -An electric light plant will soon be erected here.

Bloomington, Ill.-This city is about to enlarge and rebund its electric light plant.

Colinwood, O.—The village council has passed a resolution approving the specifications of Engineer Roberts on the electric light poant.

Concord, Mich.—W. H. Magel has been granted a franchise by this village for the construction of an electric lighting plant within this place.

Dalton, Ga.—This city contemplates arranging for the construction of an electric right plant, and has ap-pointed a committee to obtain information. Address J. M. Sanders, chairman of committee.

Detroit, Mich.—The common council committee on public buildings has been considering the proposition to secure an additional appropriation to provide for lighting the new G. A. R. memorial hall with electricity.

Hagerstown, Md.—This city will issue \$69,000 in bonds for a municipal electric light plant.

La Crosse, Wis.—The Burlington Boad is considering place of installing an electric lighting plant at Grand Cross ng.

Lixington, Gs.—A company headed by T. G. Lester reposes to erect an electric lighting plant here of 250 lights.

Manville, R. I.-An electric light plant will soon be erected here.

Montesano, Wash. -The council has taken prelimi-1..ry steps looking toward the better lighting of the cry, which has been practically without lighting since the burning of the electric light plant.

New Haven, Conn.—The Consolidated Railroad Company expects to change its lighting system from gas to electricity in its office building in this city.

New Lindon, Conn.—Bids are asked for until March 2 for runnishing the materials for erecting an electric light plant. Addresss Major S. S. Leach, U. S. Engi-

New Rochelle, N. Y.—The people of this place are serious y considering the question of municipal ownership of an electric light plant.

Pelhem, Ga.—The Pelhem Manufacturing Company will soon install an electric lighting plant.

Pittsburg, Pa.—A new electric light plant is to installed in the Homeopathic Hospital in this city.

Portsmouth, N. H.—The question of building a municipal electric light plant is being discussed here.

Richmond, Ind.—The H. I. Yaryan Steam Heating Company of Toledo has presented a proposition to the city council to put in both heating and electric lighting plants for Richmond, when the present light contract expires.

Richmond, Va.-It is reported that a movement is on foot to have an electric lighting system put in the City Hall. A committee has been appointed to inquire into the cost of getting the necessary machinery.

Rockville, Ind.—The citizens of this place will try the experiment of municipal ownership of the electric light plant, the town council having purchased the local plant will enlarge it so as to include waterworks.

Rush City, Minn.—The Rush City electric light plant was des royed by fire last week.

Saginaw, Mich.—The electors of this city will vote April on the proposition to issue bonds for \$75,000 to build an electric lighting plant.

Skaneateles, N. Y.—F. L. Rogers of Syracuse has prepared an estimate for an electric light plant to cost about \$13,000.

Snow Hill, Md.—The question of building a municipal electric lighting plant is being discussed by the citiz us of this place.

South Norwalk, Conn.—The South Norwalk electric light commissioners have been getting out plans for an in-rease to their commercial plant.

8:. Cloud, Minn.-The Great Northern contemplates the erection of a new electric building and plant at their car shops in this city.

St. Michael's, Md.—The citizens have voted to issue \$12 000 in bonds for building the electric light and waterworks plant.

Wahoo, Neb.—The citizens of this place are agitating the question of electric lighting.

Winona, Miss.—Chas. Morser and J. C. Wadsworth of this place are prepared to receive estimates on an elec-tric light plant of 2,500 incandescent and 50 arc lamps.

#### STREET RAILWAYS.

Albany, Ind —The surveying has begun on the elec-ic line from this place to Buff on via Dunkirk and ennyille. The company at the head of the project is the Essern Railway Compacy, and work on its con-struction will begin in the near future.

Atlantic City, N. J.—A syndicate composed of Philadelphia capitalists is interested in the building and operating of a trolley line down the beach, which is to be a branch of the line that is to be built over the turnpike between Absecon and St mers Point.

Belchertown, Mass.—The citizens of this place are discussing the question of an electric road.

Detroit, Mich — Arrangements for the building and equipment of a new electric railroad were made the first of the month. The new road is to connect Grand R spids with Holland and the lake shore resorts in that vicinity and will be over 50 miles long. The projectors are B. S. Hanchett of Grand Rapids, F. C. Andrews, J. Winter and O. W. Lau of Detroit.

Elkton, Md -Those in authority at the Jacob Tome Institute have been considering plans for the building of a trolley road from Perryville to Port Deposit for the accommodation of the children who attend the Institute but live out of town.

Grand Haven, Mich.-The council has granted a franchise for the proposed G and Rapids, Grand Haven & Muskegon Electric Railway.

Indishapolis, Ind.—A movement is on foot to build an electric road from Madison to this city by way of Greensburg. C. H. Wilson, F. M. Thompson and N. Jackson of Versailles are interested in the project.

Iowa City, Ia.—Cons'derable interest is manifested here among business men and residents of the west portion of the county in the proposition of building an electric car line connecting the town of Williamsburg with this city.

Liberty, N. Y.—It is announced that a Philadelphia contractor will build the Liberty-Jefferson ville Electric road next spring.

Ligansport, Ind.—The Indianapolis & Logansport Traction Company contemplates the erection of an electric line from this city to Indianapolis. George J. Marott is president of the company.

Piedmont, W. Va.—J. W. Burchinal and J E. Hooton are trying to revive the project to build an electric railway from this place to Cumberland, a distance of 28 miles

Providence, R I.—It is reported that the Providence & Danielson Railway Company will complete, during the present year, an electric line between the two places for both passengers and freight.

Salem, Ind.—The new proposed electric railway, which is to extend from Seymour to Marengo, by way of this place, is meeting with approval throughout Jackson, Washing'on and Crawford Counties.

Sistersville, W. Va—The parties interested in the construction of an electric railway from this point to Middlebourne have secured the necessary capital, and it is said that work on the line will commence on April 1.

St. Louis, Mo.—A franchise to construct and operate an electric railway was granted last week to the St. Louis County Transit Company. G. P. Hofman is president of the company.

Tomahawk. Wis —W. H. Bradley, president of the Wisconsin Valley Advancement Association, has been in the East negotiating with capitalists and railroad prijectors, with a view of having work commenced on the new electric railway system connecting the cities and towns of the valley from Port Edwards on the south to Eagle River on the north, at the earliest date possible.

Washington, D C. -A corporation known as the East Washington & Benning Railway Company is authorized to construct and operate a single or double track railway on which electric cars are to be run from Northeast Washington to Benning.

Wartrace, Tenn —An electric road is soon to be built between here and Lynchburg. The proposed route will connect and run through the richest sections of Moore and Bedford counties.

Western Port, Md.—The original projectors of the proposed electric railway from Cumberland to this place are trying to revive the scheme, despite the fact that the Allegheny county commissioners have revoked the franchise.

#### MANUFACTURING, ETC.

Indianapolis, Ind.—The Indianapolis Street Railway Company is manufacturing summer cars, which will be built on a special design never seen in this country.

Muncie, Ind -W.C. Sumpson, local manager of the Mudme, and —w. C. Simpson, local manager of the Union Traction Company's street car system, has let the contract for thirteen new motor cars, at \$2.500 each, to the St. Louis Car Company. The contract stipulates that the cars shall be running on the Muncie streets by

Passaic, N. J —The New York Belting & Packing Company has ord red from the Sprague Electric Company a 75 kw. direct connected generator for its new factory in this city.

#### COMPANY MATTERS

Raltimore. Md.-It is reported that the Susquehanns Baltimore, Md.—It is reported that the surquenanna Power Company has the power to increase its capital stock to \$5,000,000. It has authority to manufacture and dispose of electricity. For several years the company has been at work on plans to dam the Susquenanna above tidewater, and to utilize the power to generate electricity to be distributed in this city, Philadelphia and adjacent towns.

Buffalo, N. Y.—General Manager U. L. Upson of the Buffalo, Hamburg & Aurora Electric Railway has contracted with the Nordberg Corliss Engine Company of Milwaukee for the construction of two big Nordberg-Corliss engines of 450 horse-power each.

Canton, O.—The shop of the Electric Cleanser Com-any was recently destroyed by fire, entailing a loss of

Evanston, Ill.—Arrangements have been made by the Evanston Electric Illuminating Company to re-model its power house, and to re-equip its plant with entirely new steam and electrical machinery. Evanston, Ill

Kennett Square, Pa.—The representative of a New York syndicate in the purchase of the Kennett Electric Light plant has purchased the electric plants at Coatesville and Oxford, and it is said the plants will be consolidated and that they will supply the current for an electric railway that is projected.

New Brunswick, N. J.—For the purpose of having under one management a trolley road from Philadelphia to Jersey City, a meeting of the three lines now covering most of that distance—the Brunswick | raction Company, the New York and Philadelphia Company and the New Brunswick City Railway—has been called for February 16, at New Brunswick, N. J.

New York.—The Sprague Electric Company has equipped one of the Old Dominion Line steamers with a quantity of Lundell faus mounted to run in an inverted position, the motors being attached to the celling.—The Safety Insulated Wire & Cable Company has purchased 12 acres of land with 400 feet of water front on the Kills, at Bayonne, N. J., and will soon move its plant to the new locality.

Norristown, Pa.—A trolley railway deal, which embraced the transfer of \$550,000 in property, was effected lately when the Schuylkill Valley Traction Company was sold to the United Power & Transportation Company.

Rahway, N. J. - It is announced that the Riker Electric Railway Syndicate has taken possession of the Rahway-Sawaren Electric Road, better known as the Union & Middlesex Traction Company. tric Railw Rahway-S

Union & Middlesex Traction Company.

Reading, Pa.—The Arrowsmith Electric Company recently purchased the entire stock of the Reading Electrical Manufacturing Company.—The United Power & Traction Company will erect new shops here, including brass foundry and machine plant.

Waverly, N. J.—The E. S. Ward & Co. has equipped its new factory in this place with the Lundell apparatus, having ordered from the Sprague Electric Company one 25 kw. and one 75 kw. generator, belted type, of 250 volts, and fifteen motors ranging from 2 to 21 hp.

#### POWER AND TRANSMISSION PLANTS.

• Clevelard. O.—Geo. E. Collings, president of the Clevelard Faucet Company, is at the head of a movement to erect a large power house to furnish the motive ard lighting power for the entire city. He wants to erect a plant at Massillon and there generate electric power which he would transmit to this city.

Snowville, Va.—The Virginia Iron, Coal & Coke Company have taken an option on the land of Mrs L zzie Hall, for the purpose of utilizing the water power for an electric plant. By cutting a tunnel less than a half mile long they will get the fall of the river for seven miles, which will give one of the most valuable water powers in the country, as the river has a fall of from nine to eleven feet to the mile at this point.

#### MINES, ETC.

Idaho, Springs, Col.—Manager L. Hanchett of the Lamartine mine says that if he can make satisfactory arrangements with the electric lighting company of Georgetown he will build a line to the Lamartine mine and change from steam to electricity the operation of the compressors and hoists.

#### AUTOMOBILES.

Atlantic City. N. J -The Oceanic Automobile Com-Attantic City. N. 3.—The Oceanic Automobile Company has been incorporated with a capital stock of \$470,000 by New York, Philadelphia and Atlantic City capitalists. The company will begin operations here June 1. Ten of the latest automobiles have been ordered, and will be delivered in May. Buses, similar to those now used on Fifth avenue, New York, will be run on all the principal streets between hotels, railway stations, rasidences and the beach with no extra stations, residences and the beach, with no extra charge for transfers.

New Haven, Conn.—The first automobile put on t'streets by the New Haven Electric Cab Comparrived a few days ago, and Messrs. Hart and Wells of the Cab Company have used the vehicle on the principal streets of the city. The suto is a small road wagon and will be used as a private carriage by the two gintlemen mentioned. Part of the state of



# THE TELEPHONE WORLD.

#### The Largest Switchboard.

The following communication will undoubtedly interest telephone readers:

New York, Feb. 8, 1900.

ditor Electricity.

Siz: In your issue of February 7, page 76 of ELECTRICITY, ear the bottom of the first column, you have a reference to he Kinloch Telephone Company of St. Louis, Mo., and the ast sentence reads as follows:

"The company now has over 6,000 subscribers, and the largest independent switchboard in the world in their exchange."

It might be of interest to your subscribers to state that this is wholly untrue, as there are a number of switchboards in Europe larger than 6,000, notably one installed in Copenhagen, Denmark, which has 10,000 subscribers. We could mention a number of other exchanges having more than 6,000 subscribers, and if you care for this information we will take pleasure in giving it to you. Very truly yours,

ERICSSON TELEPHONE COMPANY.

#### Future Telephone Development.

"The future development of the telephone in the United States," said President Charles J. Glidden of the Erie Telephone System, to a representative of the Milwaukee "Sentinel," "can be computed based upon the plans adopted by the management of the Erie system in some of the leading cities of the country. Exchange buildings are now being erected to provide for 80,000 subscribers at Cleveland, 25,000 each at Detroit and Milwaukee, 20,000 each at Minneapolis and St. Paul. When the above growth is attained the development will not exceed that of to-day in Stockholm and exceeds by only 2 per cent. of the population of the present development at San Francisco. The development predicted would mean 150,000 subscribers for Chicago and 200,000 for Greater New York, and all subscribers must be connected with one general exchange and long distance system. At rate of increase made by the Erie system in 1899 the development above predicted will be reached by the close of 1905."

The Mississippi Valley Telephone Company, according to a Minneapolis, Minn., paper, recently made a return to the State treasurer on the gross earnings tax of the company. The year's earnings amounted to 10 cents, while the expenses of construction were \$300,000. In a letter which accompanied the statement, regret was expressed that the company had not earned more, not because of its anxiety to swell the State's finances, but because of its heavy deficit. It was explained that the 10 cents had been received from a member of the Forty-fifth regiment, who had used one of the company's telephones last fall and insisted on paying for the service. The dime is being treasured as a souvenir and will be framed by the company as its first earnings. As the deposition and revenue stamp would take all the company's earnings, it asks that the matter be allowed to go over until next year, when a better showing is anticipated.

At a recent mass meeting of the stockholders of the Kalamazoo Mutual Telephone Company, held in Kalamazoo, Mich., it was unanimously decided that they would not dispose of their property to the Bell interests, but on the contrary, raised additional money to make extensions to their property, and at a meeting of different independent companies, held immediately afterward, it was decided to extend the toll lines over the entire State.

The Citizens' Telephone Company of Terre Haute, Ind., has been reorganized. W. W. Coit, who is an organizer of independent telephone companies, will take active charge of the movement to establish a local exchange. The company has an old franchise in Terre Haute and owns some miles of a long distance line connecting with exchanges in Western Indiana and Eastern Illinois. It has never attempted to build a local exchange. It is said that the rates for business houses will be \$30 and for residences \$18 a year.

The Pittsburg & Allegheny Telephone Company, a branch of the United Telephone & Telegraph Company, which is instituting general competition against the Bell monopoly in and around Pittsburg, Pa., will begin to operate a telephone system in Allegheny County about April 1. Underground wires are being laid. The new company will begin with 5,000 subscribers.

The Richmond (Ind.) Home Telephone Company has now been in business for a year and is, according to an Indianapolis paper, making a great success. The company has over 1,000 subscribers and in addition to the local lines has built sixty-five miles of toll lines, reaching nearly all the neighboring towns. The work of building toll lines is still in progress. The company co-operates with the New Long Distance Company of Indianapolis.

#### The Situation in Detroit.

We appear to be getting at the milk in the telephone cocoanut, or, more exactly, the system by which the cocoanut, otherwise the subscriber, is to be milked, says the De troit, Mich., "News." Ever since the purchase of the independent lines by the Bell Company transpired, the managers of the latter and their associates of the former Detroit Company have made it their special daily task to impress upon the public mind the fact that the purchase, consolidation or combine did not forecast any increase of rates. This was the continuous burden of their song until letely, when an announcement of exactly opposite import was made by one of the prominent officers of the Bell Company, and confirmed by official action taken in connection with canvassing the city list of subscribers for contracts which call for a new and improved telephone instrument, at a rate almost 200 per cent. greater than that now charged for residence 'phones.

The pith and point of the whole busin as is to be found not in the fact that subscribers are to be asked to contract for the new instruments or in the company's strong recommendation of the latter, but in the accompanying announcement concerning the new switchboard and new system of service which the Bell concern is about to install. We are told, blandly and courteously, that the Blake instruments now in use will not work so well in connection with these greatly improved devices. Subscribers are perfectly at liberty to retain their present instruments, but, owing to the incompatibility mentioned, the company can not guarantee that those insisting upon such retention will get as good service as they have received in the past.

In other words, it is proposed to freeze out the \$24 a year subscribers by subjecting them to the annoyances and losses incident to an inferior and unsatisfactory service, thus forcing them to pay the higher price if they desire adequate and business-like attention to their needs. It is a lovely proposition, advanced in so sweet and ingenious a manner that its full force doesn't strike you at the first presentation.

Whether the company has not substantially and legally contracted to maintain its present service at the standard already established is a question which it would be well worth while to submit to the courts.

#### Free Telephones.

The New England Telephone & Telegraph Company has inaugurated a campaign of telephone education in Newburyport, Mass. They practically propose to put a long distance telephone into the home of any resident free of charge for four months; at the end of that time, if the party decides he does not wish to continue its use and does not find it a matter of great convenience, the company will remove the instrument without cost to the party who has had free use of it for four months. The instruments to be used are the regular long distance telephones, entitled to unlimited local service and subject to the same conditions as those now in use by business houses.

An important opinion, declaring that the law of Congress, fixing the rates for telephone service in Washington. D. C., is unconstitutional was delivered on the 5th inst. by Justice Barnard in Equity Court No. 2, of the District of Columbia. Congress, in June, 1898, fixed the maximum rate for tele phone service in Washington at \$50 a year, which is higher than the rate charged in many other cities. The telephone company, which has a monopoly in Washington, and which then charged \$145 a year for unlimited service, refused to obey the law. This brought the matter into the courts, and the consequent decision of Justice Barnard that the law is unconstitutional. "By reason of the fact that the rates fixed are unreasonably low for the service and supplies to which it must be considered they refer." Great disappointment is expressed by citizens over this decision, though it does not settle the case. An appeal will be made to a higher

At a meeting of the Newark Telephone Company in Newark, N. J., on the 5th inst., the following officers were elected: President, John M. Gwinnell; treasurer, Charles B. Smith; secretary, A. Norton Taylor; directors: John M. Gwinnell, Clement I. Walker, H. M. Cross, Edward W. Jones, A. L. Angle, James B. Curtis, Henry C. Vance, Augustus Woodruff, A. W. Deas, Caleb H. Barney and Charles B. Smith. There were 17,368 out of 30,000 shares of stock voted, of which 14,671 was what is known as Nevins stock because it is part of the controlling interest, which was recently sold to New York men by Thomas Nevins, of Orange. There is much dissatisfaction among the smaller stock owners at the sale of the controlling interest to outsiders.

The New State Telephone Company is building a new State line between Detroit and Ann Arbor, Mich. Work of construction was begun recently and has progressed as far as Dearborn. The road will be forty miles long, and is intended solely for the relief of the line to Jackson and Kalamazoo.

#### An Independent Company for Pennsylvania.

The Telephone, Telegraph & Cable Company of Pennsylvania was chartered in Harrisburg, Pa., a few days ago. The capital stock of the company is \$25,000, divided into 500 shares of \$50 each. The incorporators are Jeremiah J. Sullivan. Charles M. Swain, Charles A. Porter, Joseph B. McCall and William McLean, Jr., all of Philadelphia.

Mr. Sullivan is reported as saying that no organization had as yet been effected under the charter. The company expects to do a general telephone business throughout the State of Pennsylvania and has authority to connect with like organizations in New York, New Jersey, Delaware, Maryland and Ohio. In the larger cities, in towns where there are at present no telephone systems independent of the Bell Company, local systems would be probably organized under nuthority of the charter. Mr. Sullivan anticipated no serious difficulty in acco-nolishing this. In nearly every large town throughout the State independent telephone companies in successful operation would be connected with through lines built under the new company's charter, such beal commanies being operated through contract relations or by ownership of stock. The company would have contract relations with the Telephona, Telegraph & Cable Company of America.

#### Telephones in Japan.

A dispatch from Seattle, Wash., to the "Globe-Democrat" of St. Louis, Mo., states that the steamship Rio Jun Maru brings news from Yokohama, to the effect that the telephone system in Impantische has a maidly extended and perfected. The Ministra of Commingation has a maidly announced the opening of the high lines between Yokohama and Kobe, and between Yokohama and Osaka. The rate is 75 °8. A reduction from 25 cts, to 20 cts, is announced on the line between Yokohama and Tokio.

The plans of the recently incorporated Interstate Telephone & Telegraph Company, of which former Senator C. W. Kline, of Pennsylvania, is president and Alvin Markle and Charles Mans, Hazleton, Pa., directors, have been made public. The object of the new company, which is capitalized at \$2,000,000, is to establish a long-distance telephone service in Pennsylvania, Delaware, Maryland and New Jersey by connecting all the independent telephone systems of these States.

The Federal Telephone Company was granted rights to erect its lines in Bellevue, Pa., at a recent meeting of the borough council. The rate for business telephones is to be \$24 and for residences \$18, and the borough is to get three telephones free of charge.

The Minnesota & Dakota Telephone Company was incorporated in North Dakota with a capital stock of \$225,000. It is understood that the company will have its headquarters in Minneapolis, Minn., and will build west via Brainerd to Fargo.

The Georgia Telephone, Company of Savannah, Ga., is rapidly getting in share to furnish service to its subscribers. It is the intention of the company to make use of metallic circuits exclusively, and party lines will be conspicuous by their absence.

The Cumberland Telephone Company of Nashville, Tcnn., has purchased the People's Telephone Company of New Orleans, La., whose capital is \$600,000 and bonded debt \$400,000.

The Telephone. Telegraph & Cable Company of America having purchased the Mount Vernon Telephone & Messenger Company, is about to rebuild the entire plant.

A new telephone line between Easton and Millwood, Kan., will shortly be in working order. The poles have all been erected an I wires are now rapidly being strung.

Shawn ..., N. Y., expects to be connected with the outside world in the near future by means of a telephone system.

#### TELEPHONE INCORPORATIONS.

The Exchange Telephone Company of South Center, Kan. Capital stock, \$5,000.

The St. John Telephone Company, Topeka, Kan. Capital stock, \$2,000.

The Midland Telephone & Telegraph Company, Jersey City, N. J.—to construct and operate a telephone system from Hudson County, N. J., to the Delaware River. Capital stock, \$15,000. Incorporators: Edward J. Hale, Melville Eggleston, James C. Vale and Alfred E. Holcomb.

The Highland Telephone Company of Highland Mills, Oringe County, N. Y.—to conduct a telephone system in Orange, Delaware, Ulster and other counties in New York State. Capital stock, \$2,000. Incorporators: J. W. Cummin, W. S. Russell and Henry M. Fitch.

### **\_ECTRICA** SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt reports received by Electrical Securities are compiled from special reports received by Electrical Securities are compiled from special reports received by Electrical Securities are compiled from special reports received by Electrical Securities are compiled from special reports received by Electrical Securities are compiled from special reports received by Electrical Securities are compiled from special reports received by Electrical Securities are compiled from special reports received by Electrical Securities are compiled from special reports received by Electrical Securities are compiled from special reports received by Electrical Securities are a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness: coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gcn., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

# STOCKS.

PASSE	NG	ER F	RAILW	AYS.			PASSE	NG	ER R	AILW	AYS.		,
		Capital	Stock.	Bata and Bata -4	1				Capital	Stock.			]
WANTE.	Par	Authorz'd	Issued.	.Bate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Authorz'd/	Issued.	Rate and Date of Last Div.	Bld.	Anke
Albany, N Y. Feb 10 United Traction.	100	2,000,000	\$1,750,000	1% %Q., Nov. '#	1. 129	181	Hartford ConnFebio : Hartford Street Ry. Co	100	\$4,000,000 1,000,000	\$200,000 247.000	8 % B., Oct., '98	145	:
(Consolidation of the Albany and Troy City Bailway.)							Holyoke Mass.—Feb 10. Holyoke Street By. Co	100	400,000	400,000	8 % A., June, '98.	200	20173
Allentown PaFeb 10	ł		1		1	1	Hoboken, N. JFeb 10.			-		1	1
Allentowa & Lebi gh Val Trac Oo	l	4,000,000	1,500,000			15	North Hudson Co. (N. J.) Ry. Co	26	1,250,000	1,000,000	8 %, 1892	150	-
Bridgeport, Conn Feb 10 Bridgeport Traction (c.	100	2,000,000	2,000,000	1 % Aug., '98.	105		Indianapolis, Ind-Feb 10 . **Citisens' Passenger Ry		5,000,000	5,000,000		28	80
Baltimore, Md Feb 10 a United Railways & Elec. Cocom.	50	24,000,000	18,000,000		1634	17	Lancaster, Pa.—Feb 10 Pennsylvania Traction Co	100	10,000,000	9,900,000	******************************		_
Boston, Mass Feb 10					1	1	Lancaster & Col. Electric By West End Street Ballway	<b>:</b> ]		87,500		••	-
.iew England Street By	100 100 50 50	4,000,000 2,000,000 10,000,000	4,000,000 2,000,000 9,085,000 6,400,000	1 % Q., Jan.15, '91 16 % S., A. & O. 18% % S., Oct., '98. 14 % S., Jan. 2, '99. 2% % Aug. 98,	1 15	16 87 98 4 114 104	Louisville, Ky.—Feb 10: Louisville Ry	100 100	4,000,000 2,500,000	8,500,000 2,500,000	l¼ %., April '98, 2½ % S., Oct. 1, '98.	68 110	70 111
Brooklyn N. Y. Eeb 10; Brooklyn City By			1,928,400		237 78	239 731/4	Twin City Rapid Transitcom. Twin City Bapid Transit 7 % pid.		8,000,000	1,712,200	154 %, Oct., 198.	186	187
Brooklyn Rap. Transit Oo., tr certf  dBrooklyn Heights Railroad  dBrooklyn Oity RRguar  aBrooklyn Oueens O . & Sub. RR.	100	200,000 12,000,000	12,000,000 2,000,000	8 4 % Q., Jan., '99	107	109	Montreal, Canada.—Feb 10: Montreal Street By. Co Toronto Street By. Co	100		4,000,000 6,000,000	8 % 8., M. & N. 1% % 8., J. & J. †	293 102 <del>1</del> ⁄4	2661 168
eBrook yr., Queens O. & Sub. RR. Coney Island & Brookl n RR Kings Councy Elevated Kings Councy Traction Co Rassau Electric Railroadpfd.	100	2,000,000 4,750,000	1,884,200 4,750,000	2 % % Nov., '98.	835	::	Memphis Tenn.—Feb 10: Memphis Street Railway Co	100	500,000	500,000	***************************************	26	-
Massau Electric Railroadpfd. /Atlantic Avenue Railroad gBrooklyn, B. & W. E. Railroad	1 00	6,000,000	6,000,000 2,000,000		76	77	New Haven, Conn.—Feb 10. Fair Haven & Westville RR New Haven Street Railway Co	100		2,000,000 1.000.000	8 % S., Sept. '98. 2½ % A., July '98.	46	=
Buffalo N. Y.— Feb 10: Buffalo & Niagara Falls Elec. Ry	100				74	75	New Haven & Centerville	100 25	700,000	800,000	***********	47	-
*Buffalo Railway Co	100	6,000,000	6,870,500	1 % Q. Dec., '98.	101	103	New Orleans, La.—Feb 10: Canal & Olaiborne RR. Oo	40	240,000	240.000	4 % S., July, '98.	<b> </b>	
Columbus O.—Feb`10 Columbus Street Railroad Columbus Street Railroad, pfd	100 100		8,000,000 1,500,000	1 % Q., Feb., '99.	20	22	New Orleans & Carrollton RR New Orleans Traction Co new com. New Orleans Traction Co new pfd.	100	1,200,000	•••••	4 % 8., July, '98. 1 % % Q., Oct., 98.	148 14 29 1/4 101	
Charleston, S. C Feb 10 Charleston City By. Co	50 25	100,000 1,000,000		8 % S.	••	::	aCrescent City RR. guar. bNew Or. City & Lake RR. guar. Orleans Railroad. St. Charles Street Railway.	100	2,000,000 2,000,000 500,000	2,000,000 2,000,000 185,000 1,000,000	8 % 8., Jan., '99. 4 % 8., Jan., '99. 1 % %., June, '94. 1 % %. Oct., '98.	20% 56%	26 52
Chicago, Ill Feb 10	ł			i .	-		New York-Feb 10.	1	1			l	1
Ohioago & South Side R. T. RR Lake Street Elevated RR Metropolitan West Side Elev. Ry Metropolitan West Side Elev. Ry Meth Chicago Street RR Anorth Chicago Street RR South Chicago City RB. South Chicago City Railway. West Chicago St. RR. Co (Chicago West Div. Ry guar.	100 100 100 100 100 100 100	10,828,800 10,000,000 15,000,000 15,000,000 10,000,000 2,000,000 20,000,000 1,250,000	10,828,800 10,000,000 15,000,000 2,500,000 249,900 1,608,200 18,189,000 624,900	8 % Q., Dec. 81, '98  8 % Q., Jan., 99  11% % Q., Feb. 99	17 <sup>3</sup> / <sub>4</sub> 24 76 236	25 78 237  J11	Central Crosstown RR.  of Christopher & 10th Sts. RR. guar. Dry Dock, E. Brdw'y & Battery RR.  dMetropolitan Street Ry. Co.  «Bleecker St. & Fulton Fy. Ry. guar  fBroadway & Seventh Ave guar,  gCen. Park, N. & E. Rivers RR. guar  AEighth Avenue RR.  42d St. & Grand St. Ferry RR. guar  iNinth Avenue RR guar.  kSixth Avenue RR guar.	100	750,000 800,000	748,000	2½, % Q., Oct., '98. 1½, % Q., Nov., 98. 1½, % Q., Nov., 98. 1½, % Q., Jan., '99. ½, % A., July, '98. 2½, % Q.	395 196	280 174 150 178 40 240 40 410 206
Cine nnati, Ohio.—Feb 10: Cincinnati Inc. Plane Bycom. Cincinnati Inc. Plane Bypfd. Cincinnati, Newport & Cov. St. By. Kolincinnati Street By. Co	50 50 100		### 000		83	85	guar fTwenty-third St. R. R. Coguar. Second Avenue RR. Third Avenue RR.  ##248 tt, Manhatv'le & St. Nich. Av Union (Huckleberry) Ry.  Newark N J.—Feb 10:	100	2,500,000 12,000,000 2,500,000	600,000 1,862,000 10,000,000 2,500,000	4½ % Q. 2% Q., Jan,, '99. \$1.75 p. sh. Feb. 99.	209 898 200 1(01/4 76	211 420 205 1(0) 82 200
Mt. Adams & Eden Park Inc. Ry. Cleveland, Ohio Feb 10 Akren, Bed. & Clev. Elec. By Cleveland City By Cleveland Electric By	100 100	1,000,000 8,000,000	1,000,000 7,600,000	34 % Jan., '98 8-5 % Jan. '99,	48 991	50 100	Consolidated Traction Co. of N. J North Jersey Street Railway Co. United Electric Co. of New Jersey Pittsbupg. Pa. Feb 10:	100 100	504,000	6,000,000 <b>504,000</b>	11% % 4.	61 80 27	62 803 27)
Detroit, iMich Feb 10 Detroit Citisens' Street Ry	100 100	2,000,000 250,000 1,000,000	1,250,000 1,200,000 250,000 1,000,000		90 10034 175 90	100	Allegheny Traction Cocom. Consolidated Traction Cocom. Consolidated Traction Copfd. pCentral Traction Copfd. gOttizens Traction Co rDuquesne Traction Co sPittsburg Traction Co	50 50 50 50 50 50 50	15,000,000 15,000,000 1,500,000 8,000,000	15,000,000 [900,000 [8.000,000	2 %, Jan., '95. 8 %, Nov. '98. 1 % % Nov '7, '98. 6 % A.	54 28 61 693 69	70 70
Wyandotte & Detroit River Ry  Dayton O.—Feb 10:  City Railway Co	100 100	1,500,000 600,000	300,000 1,470,600		126 160 114	110	Federal St. & Pleasant Valley By Pgh., Allegheny & Man. Trac. Co Pitsourg & Birmingham Trac. By Pitsburg & West End By United Traction Co	25 50 25 50	17,000,000	17,000 000	3; %, Nov. 7, '98. 2; %, July, '98. 2; %, Aug., '95. 1; %, Oct. '98. 5; A., June 20, 98. J. & J. J. & J.	28 40 12 46	283 423 16 47

\*Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consol'dated Railways & Electric Company comprises in its organization the Baltimore Consol'dated Railway Company, the Baltimore Otty Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co of Baltia.ore. The pref stock of U R & Elec. Oo. has been issued in the form of income bonds.

b Leased to Brooklyn Rapid Transit Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capita' stock.

s Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR and leased to Nassau system.

h \$30 per share on outstanding capital paid as rental by leasee — West Ohicago &t. RR. Co.;

250 100 of stock owned by North Chicago Street Railroad Company.

d Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and

West Chicago Street Railroad Tunnel Company.

f 550 per annum paid on outstanding capital as rental by lessee.—North Chicago Street Railroad Company;

k Majority of stock owned by Chicago West Division Railway Company; 5 % on \$1,000,
000 stock guaranted by West Ohicago Street Railroad, assumit g its bonds

Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assumit g its bonds

\*\*Unlisted. † Full paid. | Outstanding. † Ex-div.
a Leased to New Orleas a Traction Company at 6 % on stock.
b Leased to New Orleas a Traction Company at 8 % on stock.
c Leased to Central Orossown Railroad at 8 % on stock and interest n bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
e Leased to 23d Street Ry. for 99 years; lease assigned to Metopolitan Street Ry.
f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Ry.
f Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; there after 9 %.
h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at\$215,000 per annum
i Leased to Metropolitan Street Railway for 18 % on stock
f Leased to Metropolitan Street Railway for 18 % on capital stock.

Leased to Metropolitan Street Railway for 18 % on capital stock.
n Dividends of 13/4 % verily guaranteed by Consolidated Traction Company.
o Controls by lease the Alley'ny, Cent., Oitzens' Duquesne, Fort Pitt & Pitt Traction.
p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
c Leased to Consolidated Traction Company for 8 % on capital stock.

Leased to Consolidated Traction Company for 6 % on \$3,000.000 expital stock.

Leased to Consolidated Traction Company for 6 % on capital stock.

Leased to Consolidated Traction Company for 7 % on capital stock.

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### PASSENGER RAILWAYS.

### TELEPHONE AND TELEGRAPH COS.

		Capital	Stock.						Capital	Stock.	LEGI		1
NAME.	Par	Authorz'd	Issued.	Rate and Date of Last Div.	Eid.	Asked.	AME.	Par	Authors'd	Issued.	Rate and Date of Last Div.	Bid.	. Asi
law Bedford Mass-Feb 10 Inion Street Railway Co Orthampton, Mass-Feb 10	100	\$850,000	\$850,000	-%, Feb 98,	160	165	Boston, Mass. Feb 10. American Bell Telephone Co Erie Telegraph & Telephone Co	100	50,000,000	28,650,000	1 % Q. Jan. 13 1 % Q., Feb. 20, '9: 0 \$1.50 p. sh. Feb '99	834 104	333
orthampton Street Rv	100	800,000	225, 100	4 % A., June '98,	170	178	New York.—Feb 10:		10,894,600	10,804,600	81.50 p. sh. Feb '99	135	18
maha, Neb Feb 10: maha Street Ry	100	5,000,000	5,000.70	3 % A. and N.	55	65	American Telegraph & Cable Co	100 100	4,000,000	14,000,000 6,500,000 10,000,000	1 2 2 9	96 114	99
aterson, N. J.—Feb 10:	100	1 250 000	1 250 Ocar		54		*Commercial Cable Co	100	1,000,000	10,000,000	1% % Q. 1% % 8.	1903	19
ovidence, R. LFeb 10:							*Gold & Stock Telg. Coguar. 6 %.  *International Ocean Tel Co.guar 6%	100	5,090,000 5,000,000 8,000,000	4,800,000	1% % 8. 1 % Q., Feb., '99. 1% % Q.	112	
nited Traction & Electric Co niladelphia.—Feb 10.	100	8,000.000	8.000,000	. Oct. 198	108	108%	Mexican Telephone Co*New York & New Jersey Tel. Co	100	2,000,000 5,000,000		2% % Q., Jan., '99.	8	18
drmount Park Trans. Co\$50 pd. estonville, Man. & Fairmount	50 50	2,000,000 1,966,100	1,770,000 {1,965,100	2 %, Dec. '97. 2 %, July 15, '98.	28 47	24 48	*Pacific & Atlantic Telegguar. 4 % *Postal Telegraph Cable Co *Sout'n & Atlantic Telg. Co.guar. 5 %	100	2,000,000 15,000,000 950,000	15,000,000	2 % 8. 1 % Q. 2% % 8. 8 % 8., Jan. 99.	114	1
st'nyl'e, Man. & Fairm'i % pid. Fairmount Pk. & Had. Pass. Ry.	50 50	588,900 300,000 80,000,000	\$538,900 800,000	2%, Dec. '97. 2%, July 15, '98. 3% 3—July, '98. 8% Feb. 1, '98.	75 75 851/8	76 76 33 <sup>1</sup> / <sub>4</sub>	†Commercial Union Telegraph Co Western Union Telegraph Co	25	500,000	500,000 97,870,000	8 % 8., Jan. 99. 11/4 %, Q, Jan. '99.	115	1
aion Traction Co \$12½ pd Electric Traction Co	50 50 50	500,000	8,297,920 †192,500	%8 spare Q.	345		†Div. guar. by Postal Teleg. Co. Miscellaneous Feb 10:				1.0	100	-
Frankford & Southwark Pas. R	50 50	1,000,000	11,875,000	814 ha'e A—Apr.98 A. & O.	45 48 90	451 901%	American Dist. Teleg. (Phila.) Bell Teleph. Co. (of Canada.)	25 100	400,000 8,960,000	8,564,000	1 % Q. 2 % 8.	21 188	8
TLombard & South Street Ry dSecond & Third Streets Ry People's Traction Co	25 50 50	1,060,000	±771.076	99 share A. Mar. 98	800	90%	Chesapeake & Potomac Telep. Co Chicago Telephone Co Central Dist Prtg & Telg. Co.(Pgh.).	100 100 100	****	750,000	ार्थ कर्म का	#8 200	21
Green & Coates Passenger Ry	50 50	1,500,000 500,000	572,800 150,000	8 % Jan., 1898.	144 151	145 152	Empire & Bay States Telegraph Co. Hudson River Telephone Co	100	750,000 2,000,000	******		75 114	1
hPeople's Passenger Rycom. hPeople's Passenger Rypfd. Philadelphia Traction Co	25 50	1,500,000 750,000 80,000,000	740,000 277,402		96	961/4	*Northwestern Telegraph Coguar Providence (R. I.) Teleph. Co	50	2,500,000	2,000,000 2,500,000	2¾ % Q.	96	
Ontinental Pass. Ryguar.	50 50	1,000,000	400,000 580,000	\$2 p. sh., Oct. 98. 6 % A—Mar., '98. 86 share—July, '98.	158	157	ELECTRIC LIGHT A		8,000,000  D ELE	OTR	OAL MFG.	O	0
Bmpire Passenger Ry. Co Philadelphia City Pass. Ry	50 50 50	600,000 1,000,000 1,000,000	600,000 475,000	\$7.50 share July '98	202	203	Boston, Mass.—Feb 10:				11 2 8 8 1 1	100	Ī
iPhiladelphia & Gray's Fy. RR iRidge Avenue Passenger Ry iPhiladelphia & Darby Ry.guar.	50 50	750,000	420,000 200,000	\$1.50 share July '98. \$12 share, July '98. \$2 share July, '98. 1½ % S., July, '98. \$11 sh. A., July, '98.	3083/4	309	Fort Wayne Electric trust receipts Ft. Wayne Elec Co. T. Sec. Series A.	25			rest sales	115 35	1:
Philadelphia & Darby Ry.guar. 17th & 19th Sts. Pass. Ry. guar Thirteenth & 15th Sts. Pass. Ry.	50 50	1,000,000	250,000 885,000	1½ % S., July, '98. \$11 sh. A., July, '98. \$9.50 shre, July '98	800	240	†General Electric Co. [old] com. General Electric Co. [new] " TH. Elec. CoT. Secur., Series D.	100	40,000,000 18,276,000	80,460,000 18,276,000	2 % Q., Aug., 1898. 1% % Q., May '99.	117 122	12
i Union Passenger Ry. Co i West Philadelphia Pass. Rv	50 50	1,500,000 750,000	750,000	\$10 share, July '98	250	**	Westinghouse Elec. & Mig.Co.com. Westinghouse El. & Mig. Co. pid.	50 50	4,000,000	146,700 8,996,058	15/4 % Q., Jan., '99.	42% 62	6 4
chester, N. Y.—Feb 10	100	5,000,000	5,000,000		15	16	Westinghouse El. & Mfg. Co. assent.  New York.—Feb 10:	50	11,000,000	8,195,126		•	
eading, Pa:Feb 10		1,000,000	1.000.000	Sendan.Jan.&Jy	24	26	Edison Elec. Ill'g Co., New York *Edison Elec. Ill'g Co., Brooklyn	100 100	9,188,000 4,000,000	7,988,000 2,000,000	1% % Oct., '98.	119	15
City Passenger Ry East Reading Electric Ry	50 50	850,000		Jan. 98	188 70		Edison Ore Milling Co	100	40,000,000		****	8 82	i
Louis MoFeb 10							General Electric Co. [new] " Interior Conduit & Insulation Co	100 100 100	18,276,000 1,000,000	18,276,000 1,000,000	2 % Q., Aug., 1898. 1½ % Q., May '99.	127	15
urth Street & Arsenal Ry ferson Avenue Ry. Co ndell Ry	50 50 100	400,000	150,000 400,000 2,400,000	2 % Dec., 1888. 14 % Jan., '99. 14 % Jan. '99.	::	::	Pittsburg, Pa -Feb 10	100	2,500,000	2,500,000	A. & O	110	15
tional Railway Co		2,500,000 2,500,000			::	::	Allegheny County Light Co East End Electric Light Co	100 50	500,000 800,000	500,000 800,000	J. & J	168	1
itizens' RR	100 100 50		1,500,000 2,000,000	1 % Oct., '98. 2% %, Jan., '99 1½ % Jan., '99. 50c. Dec., '89.	::		Philadelphia, PaFeb 10			550,550	5.1710		
ssouri RRople's RR. Co	50 50	1,000,000 500,000	500,000		::	::	*Electric Storage Battery Copfd.	100 100 100	2,000,000 8,500,000 5,000,000	::::=		144 120 116	1
thern Electric Ry % pref. Louis & Suburban Ry	100	2,500,000	2,500,000	3 %, Jan., '99	68	07	Northern Elec. Light & Power Co Southern Elec. Light & Power Co	10	550,000 187,500	550,000 187,500		18 80	1
n Francisco, Cal.—Jan.	100			: % A., July, '95.	••		MiscellaneousFeb 10:	25	500,000			407	
ifornia St. Cable RR ary Street Park & Ocean RR	100	1,000,000	875,000	50c mu: thly. \$2.50 share, '96.	116 50 62 <sup>1</sup> / <sub>8</sub>	68	Bridgeport (Conn.) Elec. Lt. Co Missouri-Edison (St. Louis)com. Eddy Electric Mfg. Co	25	500,000			47 25 1814	
rket Street Ry sidio & Ferries RR	100		550,000	2., 60c per share	02/g	16	Eddy Electric Mfg. Co Hartford (Conn.) Elec. Light Co Hartford (Conn.) Lt. & Power Co	100 25	850,000 175,000		:::	128	1
ranton Pa - Feb 10	50	6,000,000	2,500,000		29	80	New Haven (Conn.) Elec. Lt. Cc Narragansett (Prov., R.I.) Elec. Co. Bhode Island Elec. Protec. Co	100 50 100	1,200,000 1,200,000		2 % Q., Oct., '98.	195 95 1184	1
Scranton & Oarbondale Trac. Co Scranton & Pittston Traction Co	100 100	500,000 1,050,000	500,000 1,050,000		161/2		Royal Elec. Co. (Montreal)	100	1,000,000 1,085,000	1,085,000	2% Q 1	1925 185	1
pringfield Ill Feb 10 ringfield Consolidated By	100	750,000	750,000	-21 3000000			Thomson-Houston Welding Co Woonsocket (R. I.) Electric Co	100				105	li
Pingfield O.—Feb 10:		1,000,000	1.000,000			11	†On Aug. 17 last by a majority vot to \$20,827,200, of which \$18,276,000 is c   Recently acquired the Edison III	e or comn umir	on and \$2	551,200 pi	eferred.	‡ Ex	d
ringfield, MassFeb 10:	100						pany, the Municipal Electric Light	Co.			1		
ronto Canada.—Feb 10	100	1,200,000	1,166.700	* *	207	212	ALLIE		INDU	DIRIE	3.		1
ronto Street Ryntreal Street Railway Co	100	6,000,000 4,000,000			10 > 2 811	1(31/4	Boston Mass.—Feb 10: Delaware Gas Light Cocom.	50 50	500,000	500,900 200,000	J. & J. J. & J.	72% 98	
ashington, D. C.—Feb 10:		E00 000	600.000				Delaware Gas Light Copref. American Electric Heating Co Street Rv. & Illu'g Propertiespfd	50	10,000,000	1,248,700	\$2 p. sh. Jan. 26, '99		
t Ry. Co	50 100 50	500,000 \$12,000,000 400,000	12,000,000	65c. per sh. Oct 97.	92	921/8	Street Ry. & Illu'g Propertiespfd United Electric Securities Copfd. New York.—Feb 10:	100		1,000,000	\$3.50 p.sh. Nov '98.		10
umbia Ry. Co	50 50	707,000 200,000	652,000 200,000		85 15	40 16	Consolidated Electric Storage Co Safety Car Heating & Lighting Co	100				10	15
tropolitan RR. Co	50	1,000,000	158,900	2% % Q	**		Worthington Pump Copfd	100 100	5,500,000 2,000,000	5,500,000 2,000,000		2000	li
Forcester Traction Co6 % pfd.	100 100	2,000,000	2,000,000	8 % S. Feb '98.	80 10416	31 105%	Philadelphia PaFeb 10: Electro Pneumatic Trans. Co				- F ME	1	1
orcester & Suburban Street Ry Ilkesbappe, PaFeb 10.	100	550,000	543,500	414 %, 1897.	1	85	United Gas Improvement Coscrip. Welsbach Commercial Cocom.	10 50 100	1,500,000 10,000,000 8,500,000			ii¾	1
kesbarre & Wyoming Val, Trac	100	o,000,000	5,000,000	1%, Jan., '99.	25	29	Welsbach Commercial Copfd.	100 5	500,000 525,100		2 X Q	57% 42	5
* Unlisted. † Paid in. ‡ Full parties a Leased to Hestonville, Man &	Fair	mount Pa	ssenger k	y. for 6 % on stock	per a	nnum.	Welsbach Light Co., Canada Pittsburg, Pa.—Feb 10:	5	500,000	, , ,	THE PERSON NAMED IN	15/8	
b Consolidation Electric, Peopler ges and all indebtedness of craction Company.	onst	ituent and	d leased	companies assume	d by	Union	Carborundum Mfg. Co Standard Underground Cable Co	100 100	200,000 1,000,000	200,000 1,000,000	Q	170	17
c Practically all shares owned by Lease to Frankford & Southway	ark	Passenger	Ry. assur	oany. med by Electric Tr	action	n Co.	Miscellaneous.—Feb 10:	100		1,000,000	10000	21	2
e Leased to Electric Traction Co f Controlled by Frankford & So g Leased to People's Passenger	uth	wark Pass	enger Rai	lway.			*Barney & Smith Car Copfd. Billings & Spencer Co	100 25		2,500,000	2 %	98	10
h Majority of stock owned by F i Leased to Union Traction Com	eop	le's Tracti y.	on Compa	my.			Consol. Car Heating Co	100 100	1,250,000		1% % Feb. '98	95	6
j Lease transferred to Union Tr.	actio	on Compar	ental of	310,000 per annum	in 18	866-7-8	*Pratt & Whitney Copfd *Pratt & Whitney Copfd Stillwell-Bierce Cocom.	100			Trade beneficial.	47	5
a. \$20,000 in 1899-1900 and \$30 000	per i	annum th	ereafter, p	payable semi-annu	ally,	rental,	Sallwell-Bierce Copfd. Sallwell-Bierce Copfd.	я.	500,000		2 % Sept 1, '98.	96	98
k Dividend of 10 % guaranteed Dividend of 6 % guaranteed b	hy D	eading T-	action Co				St. Charles Car Co						

# BONDS.

PASSEN	JER R	AILWA	Y.				PASSEN	GER R	AILW	Y.			
The state of the s	Amou	mt.		Interest				Amor	ant.		Interest		
NAME.	Authorized.	Issued.	Due	periods.	Bid.	Asked.	NAME.	Authorized.	Issued.	Due		Bid.	Anke
Albany N. Y.  Date of Geotation—Feb 10, 1100  The Albany By. OcGen. mtg. 5e. (The Albany Ry. CoGen. mtg. 5e. (Watervleit Turnpike & RR.1st mtg. 5e. Watervleit Turnpike & RR.2d mtg. 6e. Troy Oity Railway Oo	850,000 150,000	427,500 875,000 850,000 150,000	1947 1919	M. & N. M. & N. M. & N.	*1173/ *1163/ *126 *125 *114	1271/4 127	New Orleans La.  Date of Quotation—Feb 10, 1900.  Canal & Claiborne RR cons mtg. 5s. Crescent City RRlst mtg. 5s. Orescent City RRlst mtg. 5s. New Orleans City RRlst mtg. 5s. N. Orleans & Carrollton RR. 2d mtg. g. 5s. N. Orleans & Carrollton RR. 2d mtg. g. 5s. Orleans Railroad Colst mtg. 6s. 15t. Charles St. RR. Colst mtg. 6s. 15t. Charles St. RR. Colst mtg. 6s. 15t. Charles St. RR. Co.'s 1st mtg. bonds 1590,000 outstanding.	\$150,000 5,000,000 416,500 5,000,000 850,000 800,000	50,000 8,000,000 899,000 2,599,500 850,000 800,000	1899 1948 1908 1948 1907 1912	M. & N. M. & N. J. & J. J. & D. J. & J. F. & A. J. & J. J. & D	105%	112
Baltimore Md.							New York Date of Quotation - Feb 10, 1900						
Date of Quotation—Feb 10, 1400  United Electric Ry. CoIst mig. g. 4s.  "	1,500,000 1,250,000 1,750,000 750,000 800,000 96,000 604,000 8,000,000	1,250,000 1,750,000  117,000 580,000 8,000,000	1949 1911 1929 1901 1942 1900 1906 1912 1982 1922	J & D. M. & N. M. & N. M. & S. J. & D. J. & J. N. & M. J. & J. M. & N.	102 743/4 1187/8 119 1041/4 121 101 1021/4  119 116 117	1021% 95 120  121%  121 117	Atlantic Ave. (Brooklyn)Imp. g. 5s. Atlantic Av. (Brooklyn)Ist gen. mig. 5s. tAtlantic Av. (Brooklyn)Cons. mig. 5s. tStroidway & 7th Avest cons. mig. g. 5s. Broadway & 7th Ave	799,000 8,000,000 12,500,000 1,500,000 500,000 1,125,000 1,000,000 6,000,000 2,000,000 1,000,000 250,000	1,966,000 7,650,000 1,500,000 500,000 1,125,000 1,000,000 6,000,000 2,000,000 448,000	1909 1981 1948 1904 1914 1924 1905 1941 1989 1988 1941 1941	M. & 8. A. & O. J. & D. J. & D. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J.	95 1073/6 115 128 104 108 115 105 116 115 101 104 112 107	110 110 122 100 110 100 110 100 110 110
All of the bonds of the above ompanies, marked †, have been assumed by the United Railways & Electic Company.  Boston, Mass.  Date of Quotation—Feb 10, 1900.  Lynn & Boston RR	5,879,000	8,702,000	1924	J. & D. M.& N.	114 104%	115 106	Brooklyn Rapid Transit	700,000 1,200,000 250,000 800,000 1,000,000 100,000	5,181,000 700,000 1,200,000 250,000 800,000	1945 1900 1902 1922 1908 1982 1914 1914	J. & D. M. & N. J. & J. J. & D. F. & A. F. & A.	109% 101% 107 125 101 117 102 108 116%	10 10 10 10 11
Vest End Street RyDeben. g. 5s. Vest End Street RyDeben. g. 4\s's. 4\s's. 674,000 in escrow to retire outstand ag bonds of absorbed companies.  Charleston S. C.  Bate of Quotation—Feb 10, 1900  Enterprise Street RRlsi mig. 5s.	500,000	8,000,000 2,000,000	1914	M. & S. J. & J. J. & J.			42d St., Man. & St. N. Av2d mtg. inc. 6s. Lex. Ave. & Pav. Ferry RR. lst mtg. g.5s. Metropolitan St Ry Co. g. m. cl. tr. g.5s. Second Avenue Ry Gen. cons. mtg. 5s. Second Avenue Ry Deb. 5s. Steinway Ry. (L. I.) 1st mtg. g. 6s. Third Avenue RR 1st mtg. 5. Third Avenue RR 1st mtg. 5s. Third Avenue RR 1st mtg. 5s. Third Avenue RR	1,500,000 5,000,000 12,500,000 1,600,000 800,000 1,500,000 850,000 5,000,000	1,500,000 5,000,000 1°,500,000 1,800 000 800,000 1,500,000 850,000 5,000,000	1915 1998 1997 1909 1909 1922 1919 1987	J. & J. M. & S. F. & A. M. & N. J. & J. J. & J. J. & J.	89 124 120 120 120 178% 116 110%	15
Oharleston City Ry		****		0.40			Twenty-third Street Ry Deb. 5e Union (Huckleberry) Ry 1st mtg. 5s.  1; Westchester Electric RR 1st mtg. 5s.	2,000,000	150,000 2,000,000	1906 1942	J. & J.	106 118 110	1
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†Redeemable at option on 60 da. notice printed debt assumed by Chicago Wiv. By. Co., controlling interest or high is owned by W. Chicago St. RR. O., lessee.  §Subject to call after Oct. 1, 1899, at 10 and interest. Assumed by W. Chi. RR. Co., lessee iInt. guar. by W. Chicago St. RR. Co.  Cincinnati, O.  Date of Quotation—Feb 10, 1900  m. New. & Cov. St. Ry. Lat Con. mtg. g. 56 t. Adams & Eden P'k In. List mig. 68	f	2,500,000	0 1922	J. & J. A. & O.	118 % 108 %	1141/4	Continental Pass. By	8 800,000 100,000 150,000 250,000 500,000 1,125,000 5,698,210 200,000 1,800,000 100,000 29,785,000	810,000 200,000 100,000 458,000 867,000 1,018,000 100,000 500,000 29,724,876	1995 1901 1905 1911 1912 1948 1910 1917 1908 1911	J. & J. J. & J. M. & S. J. & J. F. & L. A. & O. A. & O.		
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New Haven Conn.  Date of Quotation—Feb 10 1900  ew Haven St. Ry	250,000	250,000 500,000	1914	M&S J&D M&N M&N	111 111 109		Date of Quotation—Feb 10, 1100  Baden & St. Louis RRlst mtg. 5s. Cass Ave. & Fair Gds Rylst mtg. 5s. Citizens' Railway Colst mtg. 5s. Comp. Hts. Un. De. & Mer. Ter_lst	1,600 000	250,0°0 3,603,000 1,500,000 000 000	1913		100 2 109 117	1 1 1 1

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#### 96 PASSENGER RAILWAY. Amount. Interest periods. Authorized | Issued Bid. HARR. Asked. St. Lows. -Feb 10. 100 Date of Quotation 1905 M. & N. 1911 F. & A. 1916 M. & S. 1910 A. & O. 1902 J. & D. 1902 J. & J. 1904 J. & J. 1905 M. & N. 1909 M. & N. 1921 F. & A. 400,000 1,500,000 1,000,000 400,000 125,000 105 103 106 102 400,000 1,500.000 700,000 800,000 108 108 105 100 75.000 800,300 75,000 100 99% 103 80 106 116 101 100 % 104 84 108 118 100 % 122 75,000 2,000,000 2,000,000 2,000,000 1,400,000 800,000 500,000 1909 M. & N. 1918 J. & J. 1900 A. & O. 1918 J. & J. 500,000 1,091,000 8.500.000 1,091,000 1,787,000 †Controlled by St. Louis RR. Co. Controlled by Union Depot RR. Co. (Controlled by Lindell RR. Co. \$200,000 in escrow to retire 1st & 2d mig. 23000,000 in escrow. 5|\$200,000 in escrow to retire lat mig San Francisco Cal. 900,000 | 1915 | J. & J. 650,000 | 1914 | M. & S. 671,000 | 1921 | A. & O. 1918 | J. & J. 117 117 95 1,000,000 114 650,000 1,000,000 1263 8,000,000 ••••• 200,000 2,000,000 850,000 250,000 700,000 1918 A. & O. 1912 J. & J. 1914 J. & J. 1912 M. & S. 1918 M. & N. 2,000,000 126 % 105 % 115 107 850,000 250 000 125 Washington D. C. 450,000 | 1920 | J. & J. 500,000 | 1914 | A. & O. 200,000 | 1911 | J. & D. 500,000 | 1901 | J. & J. 500,000 182 Miscellaneous. 1.688,000 1928 J. & J. & J. 8,548,000 1981 F. & A. 8,000,000 1983 M. & N. 2,366,000 1982 M. & N. 18,965,000 1932 J. & J. 8,905,000 1933 J. & D. 922,000 1938 A. & O. 922,000 1938 A. & O. 4,981,000 1930 J. & J. 4,981,000 1930 J. & J. 4,981,000 1930 J. & J. 4,000,000 1928 J. & J. 650,000 1928 J. & J. 650,000 1928 J. & J. 650,000 1931 J. & J. 1,000,000 1931 J. & D. 2,000,000 1931 J. & D. 1,000,000 000 5,000,000 4,000,000 8,000,000 15,000,000 2,000,000 4,000,000 4,000,000 110 105 118 115 111½ 115 20 80 119 110½ 108 85 1195 110% 500,000 1,250,000 8,000,000 1053 108 106 5,500,000 7\$1,000,000 in escrow to retire 1st and d mig. bds. 18800,000 in treasury. Bonds guar, by Suffalo By. Co. 18700,000 in escrow to retire bonds of C. St. R.R. Co. 1887,000 in treasury. 18900,000 res'ved to redeem prior liens. 1820,000 in escrow. •With intrest ELEOTRIQ LIGHT AND ELEOTRICAL MFG. COS Boston, Mass. Date of Quotation—Feb 10 1900 800,000 800,000 2,026,000 Quar. 157 116 8,750,000 1922 Pittsburg Pa Date of Quotation-Feb 10, 1900 Allegheny County Light Co....... 68, Westinghouse Elec. & Mig. Co. Scrip 68, 1911 J. & J. M. & S. 110 Miscellaneous.-(Feb 10, 1900.) MISCOHALROUS,—(Feb 10, 1600.) I dison El. Ilig. Co. (N. York) let m. 5s... i dison El. Ilig. Co. (N. Y.) con. m. g. 5s. dison Elec. Ilig. Co. (Brooklyn)...... dison Electric Light (Philadelphia)... tings Co. El. Lt. & Pow. Co. let mig. 5s. Kings Co. El. Lt. & Po. Co. pur. money 6s. Milwaukee El. Ry & Lt. Co. let con. g. 5s. nited Elec. Light & Power Co(N. Y.)... 109 124 4,812,000 2,188,000 15,000,000 5,000,000 2,000,000 2,500,000 5,176,000 8,000,000 124 5,000,000 1221 A. & O. A & O. F. & A. 10 122 2,500,000 5,176,000 6,103,000 100 1997 120 102} 5.000,000 TELEPHONE AND TELEGRAPH. Miscellaneous. 101 100% F. & A. 1908 ..... 1911 J. & D. ALLIED INDUSTRIES Miscellaneous. Date of Quotation-Feb 10, 1:00. **500,00**0 S-IN DOD 25 107

### NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 152@16c.; Lake, 16@16ic.; casting, 15½@15½c.

The United Illuminating Company of New Haven, Conn., has given a mortgage for \$2,000,000, to the New Haven Trust Company as trustee.

The stockholders of the Southern Bell Telephone Company will hold their annual meeting in New York City on February 23. Books close February 19 and reopen February 24.

It was stated that a block of \$500,000 New York Gas & Electric 5 per cent. bonds has changed hands at private sale at about the current market price. T e purchaser is said to be one of the large insurance companies.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 17@20; New York Electric Vehicle Transportation, 9@9½; New England Transportation, 6@6½.

A special meeting of the stockholders of the Imperial Electric Light, Heat and Power Company of St. Louis, Mo., has been called for March 10, to vote upon a bond issue of \$1,500,000 to be covered by a deed of trust on the property.

The gross earnings of the Manhattan Elevated Railway Company of New York for the December 31 quarter show an increase of \$150,000, and as the expenses have been reduced \$7,000 for the quarter, the net earnings will show a gain of \$157,000.

A dispatch from Columbus Ohio, states that the entire capital stock of the Columbus, London & Springfield Electric Railway Company, \$1,000,000, has been subscribed, largely by Boston men, and that it is expected the road will be completed

The New York & Brooklyn Union Transportation Company has make applica-tion to the Municipal Assembly for a franchise for a tunnel from a point in East Broadway, near the Bowery, under the East River and to South Eighth and Kent streets, Brooklyn.

The Borough of Mt. Pleasant, Pa., has granted the Connellsville & Uniontown Electric Railway Company a right of way through the borough. The company pays \$2,000 for the privilege and promises to have the line in operation within eighteen months.

Subramas have been issued for 625 witnesses to appear before the special grand jury in New York in the Brooklyn Rapid Transit Company stock rigging investigation. The grand jury will require from ten days to two weeks and possibly more time before it will reach a conclusion.

Under a foreclosure decree in favor of the the Guaranty Trust Company of New York, and the United States Mortgage and Trust Company, issued by the Federal Court, the Galveston (Texas) City Street Railway was again sold last week. The price paid was \$905,000 and it is generally supposed the bidder represented the trust companies.

At the annual meeting of the Pennsylvania Manufacturing Company on February 5 President McCall submitted a report which shows that the income from all the companies was \$1,121,650. After payment of the fixed charges, including interest on the Philadelphia Electric 5 per cent. bonds and dividends on stocks, there is shown a surplus of \$55,422. is shown a surplus of \$58,473.

Articles of incorporation have been filed in the clerk's office of Warren County, N. J., by the New Jersey Construction Company, whose object is te construct telephone and telegraph wires in Warren and Northampton counties and do a general business in the line of taking contracts and executing work of all kinds relating to the public good. The company is capitalized at \$100,000. The company consists of Elbert B Bohen, Easton; George R. Macey, Easton and Frank Ricker and Michel Lynch, Phillipsburg.

The Speyer syndicate will loan the Third Avenue Railroad Company \$17,000,-000 for 6 per cent. for three years, which will give the company time to double its property stock and with the new \$17,000,000 stock take up the loan. Bankers receive a commission of 2½ per cent., making money cost Third Avenue nearly 7 per cent. per annum. The company is now earning but little more than the dividend it is paying on \$17,000,000 capital stock because the result of construction expenditure which caused floating debt has not yet been realized, as the work is still incomplete. plete.

Referring to the recent increase of \$5,000,000 in the capital stock of the Erie Tele-Referring to the recent increase of \$5,000,000 in the capital stock of the Eric Telephone Company it is announced that the underwriters have taken up 30,000 shares of treasury stock at par, paying therefor \$3,000,000, which, with the 20,000 shares already subscribed to at par by the stockholders and payable February 14, (to-day) will give the Eric Co. \$5,000,000 in cash with which to carry on their necessary extensions during the year, and entirely extinguish the floating debt of the company. The total issued capital of the Eric Company on February 14 (to day) will be \$10,000,000 full paid The company disbursed for extensions during the past year about \$4,500,000, making a net gain of 43,700 subscribers and a total to-day of 111,000.

It is a well known fact says the Philadelphia "Stockholder" that for sometime past Standard Oil interests have been buying the New York traction stocks in large volume. Under a charter controlled by the Standard Oil Company almost any kind of business may be engaged in, and it would not, therefore, be surprising if it were some day officially announced that it is in absolute control of the transportation facilities of Greater New York. The fact that brokers who usually represent interests closely affiliated with the Standard Oil management have been accumilating stocks of the Metropolitan, the Manhattan, the Third Avenue, and the Brooklyn Rapid Transit companies may be significant.

The Western Union Telegruph Company has decided upon an issue of \$20,000,000 4½ per cent 50 year gold bonds to be known as funding and real estate mortgage bonds. Immediate purpose of issue is to make provisions for bonds maturing during this year and in 1902, and also to provide for construction purposes, demand for special wires being constantly growing. Ten million dollars of bonds have been sold to Kuhn, Loeb & Co. The company will provide for bonds maturing in 1902 out of proceeds of new issue. These 1902 bonds are 7 per cent. and amount to \$1,163,000, consequently the company will refund in all about \$6,100.000 7 per cent. bonds and about \$7,000,000 6 per cent. bonds, in all say \$7,000,000. Saving in fixed charges is about \$166,000 annually. charges is about \$166,000 annually.

Certificates of merger in New York City with the New York Gas and Electric Light, Heat and Power Company have been filed with the Secretary of State at Albanv. They are the North River Electric Light and Power Company, New York Heat, Light and Power Company, Manhattan Lighting Company, Mount Morris Electric Light Company, Borough of Manhattan Electric Company and Black Lighting and Power Company, number one. The New York Gas and Electric Light, Heat and Power Company takes all the stock, assets and franchises of each company and assumes its obligations. The capital stock taken from each company is as follows: North River Electric Light and Power Company, \$400 000. New York Light, Heat and Power Company, \$375,000; Manhattan Ligh ing Company, \$250,000; Mount Morris Electric Light Company, \$1,500,000; Black Lighting and Power Company, number one, \$98,000; Borough of Mannattan Electric Company, \$1,000,000.

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J. & J J & D.



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NEW YORK, FEBRUARY 21, 1900.

No. 7

# <u> PLECTRICITY</u>

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# EDITORIAL NOTES.

# Shall We Have Public Ownership?

Shall this country have public ownership on a grand scale? This is the question

that is at present troubling Congress, and many bills looking to the adoption of public ownership have been introduced in both branches of the National Legislature. Strange as it may seem the considerations that are urged in favor of public ownership are the reduction of the cost to the general public, and the betterment of the service generally. As in all arguments on this question innumerable alleged facts are cited in support of the reduction of cost theory. For instance, it is stated that in 1890 Boston paid \$237 per arc lamp for its street lighting service, while St. Louis was paying only \$75 for the same service. It is urged that investigations that have been carried on in various States show that the street railways net from 15 to 25 per cent. on their actual value: that telegraph profits usually run from 12 to 30 per cent. a year, and some cases of even 116 to 147 per cent. have been unearthed during such investigations.

Turning from governmental ownership to municipal ownership, the gentlemen with socialistic tendencies behind the bills in Congress point out that Aurora, Ill., paid \$325 per annum for each electric street light while they were under private control, and but \$72 a year after the plant was taken over by the city. In this connection it might have been added-but of course it was not policy so to do-that the operating expenses of the Aurora, Ill., plant since it became municipal property, have steadily increased from \$5,243 a year to over \$10,000 a year.

Another case cited is Fairfield, Iowa, in which the cost of arc lamps is said to have dropped from \$375 to \$95 a year, which may have been the case in view of the fact that in that city the electric light plant is run in connection with the water works plant, and the cost of all labor except the wages of one man is charged to the water works account.

These and others of a similar nature are some of the arguments brought up in favor of public ownership. But admitting, for the sake of argument, that a number of municipal electric lighting plants throughout the country have proven fairly successful, there are three times as many that have utterly failed, and even when a plant is claimed to be making a creditable showing, a careful examination into the books and methods of operation will usually reveal the fact that many expenses are not charged to the electric lights that should be.

# The Outcome of an

In the issue of ELEC-TRICITY of December 21, 1898, we referred Elevator Accident. editorially to an elevator accident which

occurred in this city on December 6, 1898, and in which Mr. Walter H. Griffin, a well-known insurance man, lost his life. The accident was due to the automatic stop on the motor which operated the elevator not being properly set. Several hours previous to the accident this very elevator had been carefully examined by an inspector of the Building Department, and he had immediately reported, so it was stated, to the janitor that the stop was not properly adjusted, and yet in spite of this fact the elevator was kept in service. In the report submitted at the time as to the cause of the accident it was further claimed that the operator failed to properly judge the distance to the ground floor. The car accordingly struck the bumper at the bottom of the shaft causing the back-draw weights to raise the car weights, thus tipping the latter into the elevator shaft, and killing Mr. Griffin.

Commenting at that time on the tendency of owners of buildings to throw the blame for accidents of this nature on to poorly paid employes, we said:

"As we have stated in previous editorials, although in many cases the employes in charge of the apparatus are directly responsible for the accidents, those who deserve the greater censure are the agents or even owners of the buildings, who, with a view to keeping down expenses, invariably seek cheap labor at the possible expense of human lives."

In view of the stand we took at that time a decision recently handed down in the Appellate Division of the Supreme Court in the case of Anna S. Griffin, the widow of Mr. Walter H. Griffin, versus William D. F. Manice, the owner of the building in which the accident described above occurred, is extremely interesting to say the least. Mrs. Griffin, as the plaintiff, sued to recover damages for the death of her husband. Mr. Manice, the defendant, introduced no evidence at the trial, there being a clause in the lease to the insurance company, of which Mr. Griffin was a member, providing that the owner of the building should not be responsible for damages for any loss or injury caused in any elevator accident that might occur. In spite of this fact the plaintiff got a judgment for \$22,500 and \$700 costs, and Judge Patterson in writing the opin ion of the court stated that the responsibility of the owner of an elevator is similar to that of a common carrier, and that he is bound to maintain the machinery in good order. In summing up the judge, referring to the lease, said

"We do not construe that covenant as being binding upon the plaintiff's intestate, so as to relieve the defendant from liability for the negligent maintenance of the machinery used in operating and controlling the elevator.

"We do not mean to decide that the covenant would be binding upon him in any event, but assuming that he might otherwise be brought within its operation, we do not think its fair interpretation is such as to relieve the defendant from the responsibility for neglect in proper care, attention, supervision and inspection of that machinery and those appurtenances of the elevator which gave way and caused the death of the plaintiff's intestate.

"Under all the circumstances of the case we cannot say that the verdict of the jury was excessive."

That the owner of a building should be held responsible, if by putting in poor or cheap machinery or by employing inefficient labor an accident occurs, we have always held, and the recent decision of the Appellate Division of the Supreme Court would seem to bear us out in our opinion. If, however, the owner of a building can be held liable for damages in a civil suit of the above nature, why cannot he be held liable in case of accident with loss of life for criminal neglect? Were drastic measures adopted for cases of this kind property owners would be far more careful in the selection of elevator and other employes, with the result that the loss of life through defective elevator machinery and reckless handling would be materially lessened.

\* \* \*

The Pan-American Exposition.

In spite of the fact that it will be more than a year before the Pan-American Exposition is held in Buffalo, the in-

terest that has been taken in it and the untiring efforts that have been made to have it a success, would seem to assure that much benefit both directly and indirectly will be derived from it by the countries of the New World. In his message to Congress on December 6, 1899, President McKinley, referring to the Pan-American Exposition, said:

"This Exposition, which will be held in the city of Buffalo, in the near vicinity of the Niagara cataract, and within a day's journey of which reside 40,000,000 of our people, will be confined entirely to the Western Hemisphere. Satisfactory assurances have already been given by the diplomatic representatives of Great Britain, Mexico, the Central and South American Republics, and most of the States of the United States that these countries and States will make an unique, interesting and instructive exhibit, peculiarly illustrative of their material progress during the century which is about to close.

"The law provides an appropriation of

\$500,000 for the purpose of making an exhibit at the Exposition by the Government of the United States from its executive departments and from the Smithsonian Institution and National Museum, the United States Commission of Fish and Fisheries, the Department of Labor, and the Bureau of the American Republics. To secure a complete and harmonious arrangement of this Government exhibit, a board of management has already been created, and charged with the selection, purchase, preparation, transportation, arrangement and safekeeping of the articles and materials to be exhibited.

"This Board has been organized and has already entered upon the performance of its duties, as provided for by the law. I have every reason to hope and believe that this Exposition will tend more firmly to cement the cordial relations between the nations on this continent."

From the above, and when it is added that the State of New York has appropriated \$300,000 for exhibition purposes and that the company interested in the Exposition has authority to issue \$2,500,000 in bonds, it will readily be seen that the resources at the command of the Exposition are sufficient to ensure a most creditable show.

Being within some twenty miles of Niagara Falls. from where an almost unlimited amount of electric current can be obtained, naturally one of the principal features will be the elec-. trical display at night. The plans for the electrical illumination of the Exposition which have just been completed call for numerous electric fountains, which will surpass in beauty, so it is thought, anything heretofore shown at similar gatherings. Besides what is known as a court of fountains, which will be lighted by over 100,000 incandescent lamps. there will be a so-called electrical tower 300 feet high. In the latter will be a niche 70 feet high and 30 feet wide in which a most beautiful water display will be given. A large jet of water will be broken into drops by means of an ingenious device and under the powerful electric lights focused upon the jet the individual drops will be made to reflect the colors of the spectrum.

Surrounding the tower will be a basin 90,000 square feet in area. In front of the niche will be an illuminated cascade, the water of which will finally flow into the basin where there will be numerous allegorical conceptions of statuary rising from the water. These figures will be surrounded by fountain effects not unlike the fountain designed as one of the main features of the Paris Exposition.

One of the many novelties proposed is an electrically-luminous air fountain capable of an iridescence and color effect and peculiarity of form never before seen. Advantage will be taken of the opportunity for electrical figure work in the water basin. It is promised that this display will be exceptionally pleasing.

Some idea may be had of the electrical requirements of the enterprise when it is stated that illumination must be afforded for more than 250 acres of buildings and grounds.

From a commercial standpoint the Exposition which opens at Buffalo on May 1, 1901, should prove of no little value by familiarizing the countries of South America with the manufactured products of the United States.

THE New York "Commercial" is waging a vigorous war against the Bell Telephone Company. In a recent issue the following

editorial appeared: "The telephone monopoly is doomed. It may take a little time, but the activity of those corporate interests which are arrayed against the Bell people can have but one meaning-competition. With competition will inevitably come a reduction of rates. The people who have great respect for patent rights have no sympathy whatever with corporate greed. And the people know that the dividends paid by telephone companies are out of all proportion to the actual financial investments of such companies. The people know that they have been paying dividends on an earning capacity made possible by franchises which originally belonged to the community itself. And the people know, furthermore, that it costs less to build and maintain lines in large cities than it does in rural districts; therefore, they understand that the price of telephone stock in large cities is reckoned upon the value of franchises rather than upon the assessment of tangible property. Independent lines are making great gains. There are five distinct movements under way against the monopoly. Sixty thousand miles of wire are strung already, and every foot of it is a menace to the concern which has fattened on special privileges."

# UNDER THE SEARCHLIGHT.

## Notes and Comments on Various Topics.

A BILL has been introduced in the House at Albany, N. Y., by Assemblyman Knipp providing that hereafter no wires for telephone, telegraph or electric light shall be strung nearer than twelve inches to the center of the pole, and that all wires now strung contrary to the above shall be changed to conform with this act.

The National Weather Bureau is said to be conducting a series of experiments in wireless telegraphy that promise to yield highly interesting results. Such work does not appear to be directly related to meteorological forecasting, but the Bureau enjoys exceptional advantages for an inquiry of this sort, and if a technical excuse be needed it may be found in the possible economy that may be affected, in consequence of this venture in the transmission of the Bureau's own messages.

THE Western Union Telegraph Company has introduced at various points the system which permits the sending of four messages continuously over the same wire—two each way. It was tried on a line between Joplin and Kansas City, Mo., and failed to work. Investigation developed the fact that it was caused by zinc deposit, which is som ething of a surprise to electricians, who are proceeding to investigate the matter.

THE Texas Assembly passed a bill placing a tax of \$5,000 per annum on any telephone or telegraph company which uses its lines for conveying market quotations for brokerage business.

WILLIAM A. EDDY, of Bayonne, N. J., recently tried the experiment of photographing pieces of metal by means of electricity drawn to an iron grounding rod driven into the earth. The electric brush lights and sparks emanated from a kite sustained steel-wire. A four by five inch photograhic glass plate, used without a camera, was wrapped in three thicknesses



of black paper and three thicknesses of red paper, to exclude the daylight. Three small pieces of metal of fanciful shapes were fastened to the outside of the package, two on one side and one on the other. Then the six foot kite, flown with steel wire, was sent to a height of about fifteen hundred feet, resulting in one inch sparks at the earth and powerful brush lights. The photographic plate was subjected to hundreds of sparks and powerful brush lights for more than four hours. Mr. Eddy believes that the electric brush lights will make shadowgraphs of the metal pieces, the electricity penetrating the interposed wrappings. The plate will be developed at once. It was discovered that light rain lessened the length of the electric spark from the kite wire, but that very small sparks could be drawn with the kite only forty feet above the earth. During a fog the electric action was abnormally strong, one inch sparks being drawn when the kite was at a height of only two hundred feet. With the kite fifteen hundred feet high it was discovered that boys with wet shoes were slightly shocked through the moist earth when near the grounding iron.

THE New York "World" says that the secret issue by the Consolidated Gas Company of \$36,000,000 of debenture bonds for the purchase of the New York Gas and Electric Light, Heat and Power Company and all allied concerns illumines with an incandescent glare the new principle of law that "minority stockholders have no rights.'

THOMAS A. EDISON, Jr., says he has succeeded in constructing an electric miners' lamp, which he is satisfied is absolutely safe. The lamp has been subjected to reverse tests and proved satisfactory. The supreme test will be made this week, when it will be lighted surrounded by gunpowder.

THE definite announcement of the formation of several automobile transportation companies in Denver, Col., is causing much speculation among the owners of realty along the streets which the various lines will traverse as to the effect the service will have upon the value of their holdings. While it is generally conceded among owners of property in the residence district that a street car line depresses values in the immediate vicinity of the service, it is thought the proposed automobile service will be no detriment, but on the contrary. have a favorable effect.

MR. HITCHCOCK recently introduced in the Assembly at Albany, N. Y. a bill to compel the the placing of safety fenders on cars propelled by electricity, compressed air or cable in the streets of cities of this State, the style of fender to be adopted to be approved by the State Board of Railroad Commissioners.

A LEADING banker, in discussing the gas and electric lighting situation in New York City, said: "The purchase of all of the electric lighting companies in the boroughs of Manhattan and the Bronx by the Standard Oil interests and the control of the lighting facilities of New York by this powerful syndicate is merely an incident in a colossal deal. The public may be surprised to learn that the Standard Oil interests, in connection with the Rothschilds, now control all of the copper output of the world. They have absolutely all of the copper mines that are worth working and all of the undeveloped copper lands that are

worth owning. The uses of copper, outside of the electrical field, are boundless. Look at the amount that is consumed in manufactures, the consumption that will result from the sheathing of all of the modern warships, and the requirements of coinage by all of the countries in the world. These are but illustrations. Gas is played out for lighting purposes in the cities. Electricity is rapidly driving it to the wall, and gas companies that have not the business foresight to turn to electricity as a supplemental system will be outstripped in the race for business. Of course the Standard Oil people can very well run the two together profitably.'

MR. H. H. VREELAND, president of the Metropolitan Street Railway Company, received a remarkable Valentine on the 14th inst. in the form of a check for \$100,000, the joint gift of the members of the Whitney syndicate, the controlling interests in the Metropolitan system. The gift was presented as a token of their personal appreciation of the value of Mr. Vreeland's services in the building up and the management of the great street railway corporation of which he is the executive head, and has no relation to the salary which Mr. Vreeland receives from the Metropolitan Street Railway Company as its president. An indication of the success of Mr. Vreeland's management of the Metropolitan may be seen in his report of the results of the operation of the system for the first fifteen days of February, 1900, in comparison with the corresponding period of last year. The mileage now is the same as it was last February, yet the receipts for the first fifteen days of the current month have been \$571.053.-95, as against \$411.515.40 for the first fifteen days of February, 1899, an increase of \$159,538.-

GEN. A. W. GREELY, Chief Signal Officer, United States Army, says that all of the energies of his department are at present being directed toward the establishment of a thorough telegraph and telephone system in the Philippines to meet the constantly growing demand for such service, incident to the military operations in the islands. The lack of a mail system in the Philippines allows only telegraphic or telephonic communications, and at present over 100 telegraphic and 150 telephonic operators are established in the Island of Luzon, but as the capture and occupation of each town create a demand for a means of communication, there is an ever increasing need for instruments, operators, and other equipment.

In consequence of the heavy rains the dam of the Empire State Power Company at Schoharie Falls, N. Y., where an electric light plant is being built, has been damaged to the extent of \$2,000. Power engines and derricks have been carried down the stream. The water in the Mohawk River continues high but the ice west of Fonda is still intact.

THE elevator trust has recognized a San Francisco inventor and his backers in a substantial manner by purchasing the patent rights for the electric elevator system originally invented by Ethelbert Fraser of San Francisco and perfected through the co-operation Mahoney Brothers, contractors, George Crocker, Charles E. Green and Andrew Mc-Nicholl. The Fraser patents apply electricity as the motive power in the operation of elevators by means of two motors, thus avoiding

the disagreeable jar accompanying reversal of the movement. The San Francisco company was preparing to establish a plant in the East, when the trust stepped forward and acknowledged the merits of the invention by the purchase of the patent rights for the entire country. It is understood that the consideration received by Fraser and his friends is \$175,000. a portion in cash and the remainder in stock of the trust, although some reports place the price much higher.

THE company controlling the street lighting and horse tramway line in Bombay, India, has applied to the municipality for the privilege of converting its motive power to electricity. The company has its office in New York City, and its stock is owned principally in the United States.

J. KNIGHT HARDY, a Chicagoan, who has spent most of his life in the study of metallurgy, says he has discovered a process by which he produces from lead a metal that has all of the chemical and mechanical qualities of tin, and that also it is non-frictional. He is having his product experimented upon by large manufacturing concerns with a view to testing it for mechanical uses. He also makes a product of copper, so hard, he declares, that it may be used in car journals, and it is non-frictional. The latter product, he says, will some day be used instead of steel in railway car journals, where friction is now one of the obstacles to be overcome. The tin-like product that Hardy exhibits in ingots is as heavy as lead and it is so hard that it can scarcely be scratched with a knife blade. Mr. Hardy says that it can be produced at one-third of the cost of tin, and that for all purposes it is just as good. Both metals, he claims, can be tempered to any degree of hardness.

A class of twenty-five students from Columbia College, New York, accompanied by Professors Crocker and Seaver visited Mechanicsville, N. Y., last week to make a special investigation for scientific purposes of the power plant of the Hudson River Power Transmission Company. They were shown over the plant by Superintendent E. J. Richards, spending about three hours in the inspection. They also visited the General Electric works at Schenectady, where much time was spent in the examination of the immense plant.

THE Glasgow Tramway & Street Railway Company of Glasgow, Scotland, has awarded to the Riter-Conley Manufacturing Company of Pittsburg, Pa., a contract for structural iron and plate work amounting to 1,300 tons of shipment, and involving over \$100,000. The work on the material for this large contract is now under way at the works in Pittsburg and the Pittsburg concern expects to start work in Glasgow in April. The awarding of the contract is a distinct victory for the American manufacturer over the British.

THE Canadian Electrical Association will hold its annual convention in Ottawa June 27, 28 and 29. The following committee has been appointed to arrange the programme of papers for discussion, etc.: Messrs. J. J. Wright, Toronto; T. J. Gossler, Montreal; E. C. Cary, St. Catherines; D. R. Street and O. Higman of Ottawa. A committee of twenty interested in electrical matters at the capital was also formed to arrange with the first committee for the entertainment of the delegates, programme of proceedings, etc.

#### LONDON NOTES.

[From our London Correspondent.]

#### Physical Society.

Before this society on January 26 Prof. Ayrton and Mr. Mather read a paper on "Some Developments in the use of Price's Guard Wire in Insulation Tests" and in the discussion which followed Messrs. Campbell and Appleyard took part.

This was followed by a paper by Mr. Barton and Mr. Lownds on "Reflection and Transmission of Electric Waves Along Wires," and one by Mr. T. J. Baker on "The Frequency of Transverse Vibrations of a Stretched India-Rubber Cord."

Mr. Rollo Appleyard contributed a paper on "A Fault Test for Braided and Other Cable-Core," this being a method for finding a fault without removing the braiding or tape. He subsequently exhibited some mirrors produced inside incandescent electric lamps by the application of voltages much above those for which the lamps were designed, and the consequent deflagration of the filaments.

#### **London Underground Electric Railroads**

The experiments which have recently been proceeding with a view to conversion of the Metropolitan underground railways from steam to electrical working have not yet reached a stage which enables the board to come to a definite decision. The chairman of the company has expressed himself disappointed with the delay in completing the trials. These experiments have been generally conducted after the traffic has ceased at night and on Sundays, but this is not considered to be a fair test. The section of line which has been prepared with electrical conductors is between Earl's Court and Kensington and is about a mile long, but we gather that the company has made other trials on land at Wembley Park, which have furnished valuable information which is expected to assist materially in solving the present problem. In connection with this matter we may mention that the District Company which works along with the Metropolitan to a large extent, is applying for Parliamentary powers so that it may erect and equip electric generating works at Chelsea for working the two undertakings, and further for furnishing energy to other projected underground lines.

The City and South London Railway Company has for some reason or other found it necessary to pay a reduced dividend, which brings the dividend for 1899 below 2 per cent., but as the Clapham, Moorgate Street, and Islington extensions are now well in hand, the first two nearing completion, not much importance need to be attached to the reduction. Without these extensions the line never could possibly be a great success financially, but when they get to work the traffics to be dealt with will be so enormous, on account of the favorable districts tapped, that notwithstanding the very heavy capital outlay upon underground tunneling operations the profits promise to be more satisfactory than the pioneer line, in fact they are thought to be the salvation of the concern. The new power station was expected to be completed months ago, but these anticipations have not been realized, and March will witness their fulfillment.

The Central London Railway will not commence working until March or April. It will be remembered that this is the railway for which so much American machinery, etc., is

being supplied, but so far as we understand the fault for the delays does not lie with the electrical plant contractors. A variety of other unavoidable delays have arisen, among them being the difficulties in getting steel work delivered.

Construction work in connection with the Great Northern and City, and the Baker Street and Waterloo electric underground lines is being pushed forward and other new schemes are now being projected.

# RELATIVE EFFICIENCY AND DE-SIRABILITY OF VARIOUS TYPES OF ENGINES ON CENTRAL STATION LOADS.\*

BY A. W. RICHTER.

The first records in the history of the steam engine are those of Hero, 120 B. C.: But for many centuries following little of any real commercial value was accomplished by the different inventors. In 1698, Thos. Savery patented a device which was used to some extent to raise water out of mines and which might be considered as a partial commercial success. To Newcomen and Calley (1705) is awarded by some the honor of being the inventors of the modern steam engine. This appears a just claim despite the familiar story of the invention of the steam engine by Watt as a direct result of his observing that the cover of the kettle rose as the steam escaped from the boiling water. Newcomen and Calley were the first to produce a train of mechanism capable of transmitting power from its source to the resistance to be overcome.

Watt, however, has done more than any other one man toward the development of the steam engine and receives credit accordingly. In 1763 a model of the Newcomen engine was put into Watt's hands for repairs; this led him to a deeper study of the steam engine and to an experimental reseach into the properties of steam. Watt determined the source of the loss of heat in the Newcomen engine, then he determined the amount of these losses and finally sought the remedies. Watt saw that it would be advantageous to keep the cylinder "always as hot as the steam that entered it." To accomplish this he devised the separate condenser and air pump, his greatest invention. From the time of Watt, the development of the steam engine has been gradual but certain, probably the only very rapid advance being that of Corliss when he brought out his detachable valve gear.

All requirements of the electric station engine may be summed up under the head of economy, economy being used in its broadest commercial sense. It includes not only the fluid efficiency of the engine proper but also the mechanical efficiency of the machine. durability, and the ease of subdividing into the most economical units, it being borne in mind that the demand for power changes with the different seasons as it does also during the different hours of the day. Close regulation may also be considered a subdivision of this general requirement, economy. Many of us remember the condition of the lights as regards intensity and uniformity some 15 years ago when electric lighting was first introduced The engine builder has as yet not met the demand of the dynamo as regards regulation. This deficiency, at first met by but one or two firms, was grad-

ually remedied by the majority until now many engines are on the market with regulation sufficiently close for lighting purposes. Some are guaranteed to regulate as close as one half of one per cent., allowing a variation of but one revolution in two hundred per minute. Although the question of regulation may be considered as solved by many manufacturers, great care must be exercised in this direction when choosing a station equipment.

From the time of Savery and Newcomen, with a duty of but a few million foot pounds per one hundred pounds of coal, the engine has gradually advanced, until we have attained the high efficiencies of the present day. The very highest efficiencies reported are those of the Nordberg pumping engines at Wildwood, Pa., showing the remarkable duty of about one hundred and sixty-three millions foot pounds per one million B. T. U., and the performance of the Sibley College quadruple expansion engine with a reported consumption of less than ten pounds of steam per I. H. P. per hour.

Such high economies have not been reached in power and lighting station engines, and probably never can be, but there is no reason why with modern appliances and with the gradual improvement in the efficiency of such appliances, results more nearly approaching these should not be attained in station engines.

Considering the efficiencies quoted as standard we must look upon the station engine as a very uneconomical machine; this is especially true of the street railway engines. The deficiency is due principally to the great fluctuation in load added to the fact that the engines are usually underloaded, in order to enable them to carry the "peak" of the load.

The general improvement called for in station engines, as indeed in all other engines, is the reduction of—

First—Cylinder wastes effected by (a) the kind, size and style of engine, and (b) the introduction of the storage battery and other equalizing devices.

Second—Transmission lesses from cylinder to dynamo.

Third—Losses and wastes in auxiliaries, piping, etc.

In discussing the style of engine for powerand lighting purposes, time will not permit a discussion of all the details, but it is hoped that some of the principal points may be made clear. In order to meet the demands of the varying load on the engine, the work done in the engine cylinder must be varied, the changes being in all cases automatic. This is accomplished by throttling as in the throttling engine or by varying the range of cut off as in the automatic cut-off. The only advantage of the common throttling or slide valve engine is its cheapness. The workmanship is usually very poor, causing leaks and increased friction. This engine uses more steam per given power than any other engine on the market, its consumption being about sixty pounds of steam per indicated horse power per hour, in some cases it even exceeds that amount.

The only circumstance that would make the use of this engine excusable, though probably not advisable, would be if all the exhaust steam were used for heating purposes. The great difficulty, however, is that seldom, if ever, can all of the exhaust steam be utilized. Having then practically discarded the common throttling engine, we will consider for a moment the automatic cut-off. Classified as to valve gear



<sup>\*</sup> Abstract of paper read at the eighth annual meeting of the Northwestern Electrical Association, Milwaukee, Wis., Jan. 18, 1900.

we have the drop cut-off engines and these engines which have a positive valve gear. Considering speed as a basis we have the high and low speed engines. We have also the condensing or non condensing engines, the simple, compound, triple expansion engines, etc.

The principal types of the drop cut-off engines are the Corliss and some poppet valve engines. The advantages of these engines lie in the fact that steam is admitted at a pressure almost equal to the boiler pressure. A more perfect steam distribution can be maintained for the different points of cut-off. The rapid motion of the valve at cut off and admission causes less wire drawing at these points. All of these points result in an increased efficiency. The first cost of these engines is however considerable as the valve gear is usually quite complicated.

The action of the Corliss and other detachable valve gear engines limits their speed to that of slow and medium speed engines.

Passing on to the consideration of the high and slow speed engines we find that all engines may be run direct connected. The high rotative speed permits the direct connection of engine and dynamo at less cost than the slow speed, as the reduction in speed necessitates an increase in the size of the dynamo and engine and in the amount of material used in their construction.

Increasing the speed of an engine reduces the time allowed for initial condensation and therefore, other things being equal, reduces the amount of steam condensed in the cylinder. On the other hand, high speed engines are usually constructed with a proportionately shorter stroke than are engines of less speed and with greater clearances and port areas. thus presenting more condensing surface to the inflowing steam. They are, consequently, more subject to internal wastes by cylinder condensation. High speed engines are more easily regulated and operate with less friction: they are, however, more subject to wear and accidents. Accidents occurring with high speed engines are usually much more serious in results than with engines running at lower speeds. The slow speed engines are generally more economical insteam consumption though some of the high speed engines, as the "Willans," show a remarkably good efficiency.

If it is desired to obtain the very highest engine efficiency, slow or medium speed engines should be used, while if the first cost is of prime importance, it might be advisable to use engines of high speed; but it should be remembered at all times that the cheaper engine usually increases the cost of boilers and auxiliaries. There is no reason however why the high speed engine should not be used for the necessary duplicates.

Condensing engines are more economical than non-condensing because the temperature of the exhaust steam is less. As the effective steam pressure is greater for the same cut-off a smaller cylinder is required for the same power. With engines of equal power and of the same size cylinders the steam can be cut-off earlier in the cylinder of the condensing engine, consequently less steam is used per stroke and therefore per horse power. The cylinder condensation and subsequent re-evaporation depends in part upon the range of temperature in the cylinder through which the steam acts. The compound engine has an advantage over the simple engine in that this range of temperature is reduced; the volume of each of its cylinders is less, and consequently the

condensing surface, which gives of course a lower initial condensation. The efficiency of the compound engine is also increased by the fact that the steam re-evaporated during expansion is again available for work in the next succeeding cylinder.

Compound engines are used more generally than triple expansion engines, not alone on account of first cost but also because of the variable load; triple engines cannot attain a sufficiently greater economy to warrant their use in many cases. Of the compound engines, the tandem has an advantage in first cost, compactness and small friction. The cross compound has lighter stresses in its running parts and has no dead center when the cranks are set at an angle of ninety degrees.

Engines of the vertical type require less floor space and have less friction as compared to those of the horizontal type.

On several occasions the following question has been put to me by members of the electrical fraternity-"Is it advisable to place a heater in the exhaust of a condensing engine?" It seems that claims are occasionally made by unscrupulous agents that the feed temperature can be raised to a considerable amount, say two hundred or one hundred and eighty degrees. Suppose we have a pressure of two pounds absolute in our exhaust pipe, corresponding to a temperature of one hundred and twenty-six and three-tenths degrees. It stands to reason that if a heater be introduced without changing the conditions, the temperature of the feed water leaving this heater must be considerably below one hundred and twenty-six degrees. Should the temperature of the feed water be higher, it would simply show that with the introduction of the heater sufficient resistance has been introduced to raise the temperature and pressure of the exhaust steam and consequently the back pressure on the engine. The loss occasioned by the rise in the back pressure will of course be greater than the gain occasioned by the rise in the temperature of the feed water. This would be true even though the vacuum gauge, which is usually connected directly to the condenser, may show no apparent change of vacuum.

With the possible exception of the rolling mill, the variation in load upon an engine is probably no where as great as in the electric station. This is especially true of the street railway engine in which we have sudden changes of from a few amperes to the maximum output of the station. The lighting load offers no such great sudden changes, although here also the load varies considerably with different hours of the day.

Unless other means are provided, the engine must immediately respond to these variations of load; the engine must then be of a size to enable it to carry the heavy maximum load. It will at once be seen that for a greater portion of the time the station engine is an underloaded machine. This evil has been greatly mitigated by the introduction of the storage battery. In taking up the rapid fluctuations, the battery relieves the engine of this duty and makes the engine load more constant. We are told of tests in which the fluctuation of the engine load has been decreased to a remarkable degree.

In an article on "Electric Tramways with Stationary Accumulations" by Ludwig Schroder, the following appeared in the "Electrician," London, July 30, 1897.

In speaking of the Remscheid Electric

Tramway he says: "The battery consists of two hundred and fifty cells having a capacity of 648 ampere hours at a discharge rate of 216 amperes, though a current up to 420 amperes may be taken from them. Eight cars seat sixteen passengers each and there is standing room for twelve more. The current delivered to the line for factory motors and tramway varies from 100 to 460 amperes on week days the mean being 232 amperes. The current from the machine varies from 210 to 255 amperes. Without the factory load the current supplied to the line varies from 0 to 375 amperes, its mean value being 135 amperes; the currrent from the machine varies from 115 to 150 amperes. The pressure varies from 495 to 510 volts. It has been calculated that at this station over eleven tons of coal are saved per week since the traction system was altered, but it is not only the coal consumption that must be considered. Two hundred horse power of dynamo output has been saved and the battery that effected this saving only cost one-half as much as the machines which have been set at liberty and are now available for any further increase in the load.

In reports of the Chicago Edison station it appears that about twenty-five per cent of the peak of the load is carried by the batteries.

Many similar cases could be cited but those given will be sufficient to illustrate the effect of the storage battery when introduced as a part of the station equipment.

The extreme fluctuations and the peak of the load being carried by the storage battery the size of the engine can be reduced. The engine can be of a size more nearly equal to the average load of the station. Its cylinder condensation could thus be reduced. As the fluctuations decrease, the triple expansion will show a greater commercial gain over the compound and simple engines. It will be possible to introduce larger units with an increased economy.

There is now and always has been a tendency

There is now and always has been a tendency toward the introduction of higher steam pressures. The time is probably not far distant when steam pressures of 400 or 500 pounds will be used with a corresponding increase in the number of cylinders. All of these conditions will tend to increase the efficiency of the station; the greater the improvements, the more nearly will the efficiencies approach those of engines having perfectly constant loads, as our modern pumping engines.

## Conductivity of Amalgams.

The resistance of amalgams possesses a special interest, as shedding light upon the problem of metallic conduction without introducing the complications of structure inherent in solid metals. But even so, the amalgams must be dilute and of pretty high temperature if they are to give simple results. Weber, Matthiessen, Veigt and Battelli only obtained consistent results with perfectly homogeneous amalgams. A. Larsen has done some work on the amalgams of lead, zinc, cadmium, tin and bismuth at the ordinary temperatures of liquid water, and plotted curves showing not the change of conductivity but the change of conductivity as compared with that of pure mercury. The general result that of pure mercury. The general result from the lead amalgams is that the relative conductivity increases in proportion to the temperature, and that increase again increases with the concentration of the amalgam, though not quite so rapidly as that. This rule applies up to the saturation of the amalgam, which occurs at a concentration of about 1.6 per cent. in lead amalgams, 2 per cent. in zinc amalgams, and about 5 per cent. in cadmium amalgams. All the results indicate that in the amagams. All the results indicate that in the dilute amalgams the metal is dissociated, and this dissociation, as generally in solutions, increases with the temperature—A. Larsen in Ann.d. Physik, No. 1, 1900. The Coventry Tramway System has of late undergone many changes. A new generating

station has been built, the plant extended, and

new routes have been opened for traffic.

The number of cars in regular running is now 16, while on special occasions 20 motor cars and 5 trailers are put in service. The length of line amounts to 8½ miles single track, and 2 miles double track, the latter being the total length of the turnouts; the ruling curves are of 40 to 60 feet radius, and the maximum grade is 1 in 12, 60 yards long.

The new power station is situated in a central position. The engine room is 25 feet wide by 80 feet long, and the boiler room 40 feet by 60 feet; the stack is 100 feet high, 6 feet 4 inches diameter at the top, and is based on a concrete foundation 22 feet square.

There are four Babcock & Wilcox boilers, two of 172 hp., and two of 106 hp., fitted with patent mechanical stokers and endless chain conveyor; the latter carries the coal direct from the coal store alongside the canal. The grates are of the open ash-pit type, with patent steam-jet fire-bars. The station is in the happy condition of having a good demand for ashes, which not merely cost nothing for removal but are paid for.

A Green's economizer of 240 tubes, is provided; the scrapers are driven by a small steam engine, formerly used for lighting at the old station, and which also drives the stoking machinery. There are three Worthington pumps, each of which can feed three boilers; the make-up water is drawn from the town mains, with the canal as an alternative. The condensed water is passed through a filter to free it from oil.

The engines which were originally installed were simple and non-condensing; these have been compounded by the addition of highpressure cylinders in tandem with the others, and are now run condensing at 150 hp. each. They have also been fitted with new fly-wheels, with which are combined governors of the Begtrup type. The old ones drive the original generators by leather belts, 15 inches wide, with cemented joints, which run with remarkable smoothness. The two new engines are coupled direct to their generators, and run at 250 revolutions per minute, developing 150 hp. each. The cylinders of the latter are 13 and 19 inches in diameter, with 13 inches stroke. The Begtrup shaft governor is being largely applied to engines for electric traction and transmission of power, on account of its high sensitiveness and quick action under extreme variations of load. Both high and low pressure valves are actuated by the one spindle, which is directly controlled by the governor, so that the cut-off and compression in both cylinders are immediately altered upon a change occurring in the load. The stuffing box between the two valve-chests is packed with U.S. metallic packing, and although it is inaccessible without removing the cover of the valve-chests, we were informed that it gave no trouble.

The older generators are of the four-pole type, running at 650 revolutions per minute; the others are six-polar, running at 250 revolutions per minute; all are rated at 100 kw: each.

Besides the four large sets, a small lighting set, consisting of a single-acting engine and dynamo, has been provided for use after the

traction generators have been shut down; as the dynamo runs at 500 volts, it is available for working the shop motors if required at night, besides lighting the car sheds, power station and any part of the track where work is being carried on. The dynamo is multipolar, of 17 kw. output, and runs at 400 revolutions per minute.

ELECTRICITY.

The condensing plant, which is fixed in a pit

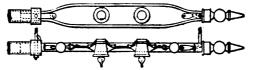


FIG. 1.—HARP FOR BRACKET ARM SUSPENSION. in the floor of the engine room, is in duplicate, each set consisting of a surface condenser of 450 feet surface, and a pair of balanced vertical air-pumps driven through single reduction double helical gearing by a steam engine.

The air-pump barrels are 12½ inches diameter, with 8 inches stroke, making 100 double strokes per minute when the engine runs at 300 revolutions per minute. A centrifugal pump is driven from the fly-wheel of the engine by means of a belt, and draws water from the canal at one point, circulates it through the condenser, and returns it to the canal at another point. Each set is capable of dealing with all the steam from the engines when indicating 300 hp. Although the plant is situated

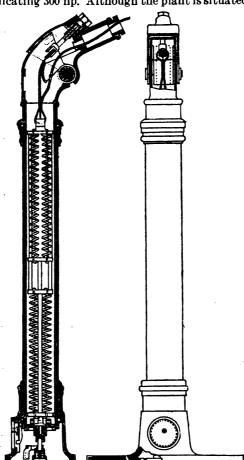


Fig. 2.—Constant Pressure Trolley Standard.

below the floor level, it is so arranged that every part is readily accessible, and the condenser tubes can easily be withdrawn. An automatic relief valve is provided for atmospheric exhaust in case of need.

The main switchboard consists of eight panels—four generators, two feeders, one lighting and one Board of Trade—and is at present incomplete, the ornamental border and clock being lacking. The panels are of marble, and are equipped with the usual apparatus. Two of

them were in use in the old station, and are provided with triple main switches, but on the newer panels the equalizer switch is combined with the circuit breaker. A watt-hour meter is in circuit with each dynamo, behind the board, and Wurts' non-arcing lightning arresters are in use.

The track rails are of the girder type, 6 inches high, and weigh 65 and 84 lbs. per yard; they are carried on steel sleepers 10 feet apart, to which they are secured with clips.

The Falk cast-welding system has been adopted for the rail joints on the new sections, as well as on a large part of the original tracks. The rails are cross-bonded with Chicago bonds.

Most of the new overhead construction has been carried out on the side bracket system, with center trolley; the arms are, therefore, very lengthy. The insulators are supported by bow-strings fixed in harps, which were designed by Mr. I. E. Winslow, chief engineer; one form of these is illustrated in Fig. 1. Rosette and side pole cross suspension is also used in places. The height of the trolley wire owing to bridges, etc., varies from 16 feet to 22 feet; to maintain an even pressure of the trolley on the wire over this wide range a special trolley standard, shown in Fig. 2, is used, the invention of Mr. Winslow. The illustration shows that in this type the springs are concealed in the body of the standard, with great advantage on the score of appearances; the leverage of the springs is made to depend upon the slope of the trolley pole by means of a cam of suitable shape with the result that the upward pressure is the same in all positions of the pole. A castiron "bonnet" is used to keep the standard rain-proof, and the rotating parts, as well as the pivot of the trolley pole, are mounted in ball bearings; electrical connection is maintained by means of a spring contact in the base of the standard. The whole arrangement is extremely neat and compact. It is fixed near the center of the roof of the car, one seat being omitted to provide space for it.

The trolley wire is of hard drawn copper, 0.32 inch diameter, and is double in most parts of the system. It is supplied by feeders laid underground in the town, but carried on the poles in the open country. There are three feeders of 0.24 square inch cross section, 300, 1,900 and 1,300 yards in length, and one feeder of 0.5 square inch, 1,200 yards long. There are no insulated return feeders, but the rail return from the old line, five miles long, is supplemented by old rails laid four in parallel and jointed with plastic bonds.

There are two six-track car sheds, capable of accommodating 12 and 15 cars respectively. One of these is operated with transfer tables, but in the newer one points and crossings are in use. A well-equipped repair shop is annexed to the larger shed, where all sorts of repairs are carried out; cars are rebuilt, armatures rewound, wheels forced on axles, and trued up by means of a car wheel grinder. The latter is fixed below the floor level, so that a car can be run into position and its wheels ground true with corundum grinders with a minimum of time and labor. Amongst other machines in this shop are two screw-cutting lathes, two drilling machines, hydraulic wheel press, shaping and screwing machines, and wood-working tools, driven by a 5 and a 10-hp, motor.

The cars are of various sizes, all double-deck: each car weighs 5½ or 6½ tons empty, is mounted on the Peckham truck, and is fitted with two 20-hp motors. The gear is of steel, with a ratio of 4.61 to 1. The maximum running speed is

<sup>\*</sup>From the "Electrical Review." London.

10 miles per hour, and the schedule speed 6 miles per hour. To ensure efficient service, a bonus of £1 every four months is granted to every motorman and conductor who has had no accident, and whose conduct has been satisfactory.

# A NEW TELEPHONE SYSTEM FOR PARTY LINES.\*

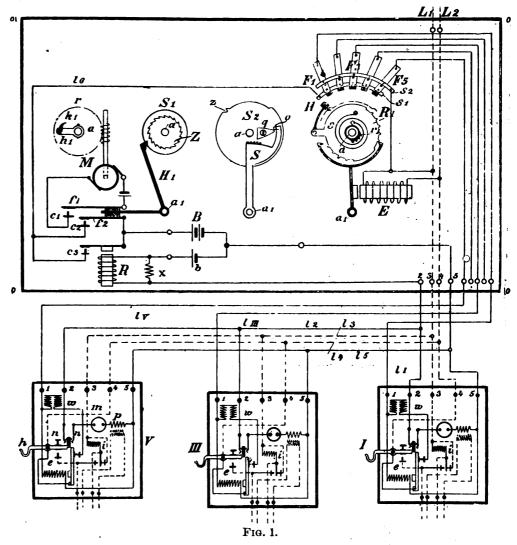
BY JUL. H. WEST.

Telephone party lines have the purpose of cheapening the use of the telephone for that class of subscribers whose number of daily conversations is limited. The duration of an average conversation is about 2.5 minutes, and the average number of daily conversations per subscriber is, in England, about eight; that is to say, an ordinary subscriber in England uses his telephone 16 times per day, and each time for 2.5 minutes—i.e., 40 minutes per day. The duration of the daily service being generally 15 hours, the line and apparatus of an ordinary telephone subscriber is in use only 5 per cent. of the allowed time. The best way to cheapen the use of the telephone is to have the telephone system more intensely used. If three subscribers, A, B and C, use their lines only 5 per cent. of the daily time, if we connect them to the exchange by means of one common party line, this line will be in use 15 per cent. of the daily time of service. It is clearly understood that the telephone company can give a telephone service to the subscribers on such lines cheaper than if every subscriber has his own line.

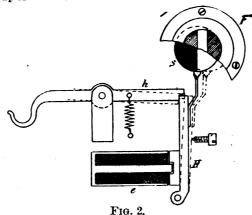
As in the instance chosen the daily speaking time on the common line is only one-seventh of the daily time of service, it will seldom occur that the telephone will be engaged by one subscriber when one of the other subscribers wishes to use it. Of course this will happen sometimes, and then the second subscriber must wait until the first subscriber has finished his conversation. This is the only inconvenience of the new system of common party lines, and as compensation for this the subscribers on the new system enjoy a reduction of 30 to 60 per cent. on the ordinary telephone rates.

The system invented by me and described in the following paragraphs allows the telephones of two, three, four or five subscribers to be connected to the exchange by one common party line. A small alteration in the construction of one of the apparatus used would allow a still greater number of telephones on one circuit. A diagram of the system is shown in Fig. 1. The system contains a small central apparatus, O, O, O, O, and the telephone apparatus of the different subscribers, of which only three-I, III, V-are shown in the diagram. The central apparatus is connected to the exchange by means of the common line, which can be either a double wire, L<sub>1</sub> L<sub>2</sub>, or a single wire, L1; in the latter case the other wire, L, must be earthed. These two wires L, L, and two other wires l, l, branch out to all the subscribers' telephones; besides that, each of these is connected to the central apparatus by means of a special wire li, liii, lv. These wires being rather numerous, the system is mainly designed for such cases where the subscribers of one party line are in the same building. The central apparatus may be located in any suitable place in the building, preferably beside the telephone of any one of the subscribers. The batteries of the whole system, containing seven accumulators, are placed together at the side of the central apparatus.

As soon as one of the subscribers takes his telephone from the hook, all the other subscribers' stations on the same line are immediately "locked" so that none of the other subthen H prevents h from moving downwards. In Fig. 1, in the subscriber's station, h is the switch hook, c is the electromagnet just spoken of, m is the microphone, p is the primary of the induction coil, i is the magneto-generator, and w is the bell. When subscriber V takes his telephone from the hook, he at once inserts his two telephones (not shown in the diagram) and



scribers can hear the conversation or disturb it; and similarly, when the exchange rings up one of the subscribers, all the stations on the line are locked at once, and immediately afterwards—by means of the central apparatus—the one station which is to be rung up is "unlocked" and its bell inserted in the



circuit, so that the subscriber may be called without any of the other subscribers being disturbed.

The locking and unlocking device is shown in Fig. 2. At the end of the telephone switch hook his the armature lever H of an electromagnet, e. When e attracts its armature,

the secondary of his induction coil in the circuit of L, L, and at the same time he closes the microphone circuit by way of the two springs n n; in this circuit is the battery b and the relay R. To prevent the self-induction of R having any influence on the microphone current, R is shunted means of an inductionless resistance, x. When R attracts its armature the circuit of the locking battery B is closed at ca; therefore it sends a current by way of c, l, into the contact plate s,, and from this into the five springs F<sub>1</sub> F<sub>5</sub> bearing against it and over the wires  $l_{\rm I}$   $l_{\rm V}$  to the binding posts 1 of the subscribers' stations, through electromagnet e, to the binding posts 5, and then by way of the wires l<sub>s</sub> back again to the battery. In consequence the electromagnets e attract their armatures, thus locking all the stations except station V, where the hook h had already turned down before e could attract its armature.

Subscriber V can now in the ordinary way ring up the exchange, while the other stations are locked. In connection with the locking lever H (Fig. 2) is a signal disk, s, which appears behind a small window, F, in the box of the stations, and indicates whether the line is busy or not. In the first instance the white and in the second case the black part of s is visible behind the window.

When the exchange calls one of the subscrib-

<sup>\*</sup> From the "Electrician," London.

ers, it sends, according to his number on the line, one, two, three, four, or five short impulses of current which pass through the electromagnet E of the central apparatus. The construction of the central apparatus is shown in Fig. 3 in longitudinal and cross sections and in plan, while in Fig. 1, within the lines O, O, O, O, the different parts are shown in detail, together with their connecting wires. apparatus contains two spindles, a, a<sub>1</sub>. On a is fixed a small arm, h1, with a movable ratchet k1; the latter works in a toothed wheel Z; this wheel and the two disks S1 S2 are fixed together and turn freely on the axis a. This is also the case with the toothed wheel R<sub>1</sub>, in the teeth of which works a pinion pivoted on the spindle, a,, and carrying the armature of the electromagnet E. Fixed together with R, is a partly toothed wheel r, which works in the partly toothed segment S pivoted on the spindle a1. The spiral spring s is fixed with its inner end to R,, while its outer end is fixed to the bearing plate above the spindle a, so that it tends to turn R<sub>1</sub> and r<sub>1</sub> in the direction of the hands of a watch.

When the central office sends, say one impulse of current, the pinion carrying the armature of E releases the toothed wheel  $R_1$  by one cog, so that the hammer H, pivoted on an arm of  $R_1$ , will be opposite to the contact spring  $F_1$ . In moving forward the hammer resting in the slot z of the disk  $S_1$  turns with it  $S_2$ ,  $S_1$ , Z; in the normal position the upper end of the two-armed lever  $H_1$  rests in a slot of the disk  $S_1$ . Therefore, when  $S_1$  turns, it turns the lever

spring from the lower contact rod  $s_1$  and presses it against the upper contact rod  $s_2$ . By this movement of  $F_1$  the locking circuit of the subscribers' apparatus I is interrupted, and the bell w is at the same time inserted in the circuit of  $L_1$   $L_2$  leading to the central office. The apparatus I is thus unlocked, and the subscriber may be rung up by the office in the

 $r_1$   $R_1$  in the contrary direction to the hands of a watch until H reaches the small slot z of the disk  $S_2$ . Immediately afterward q releases the projection o, thus allowing  $r_1$   $R_1$  to move again a small distance in the direction of the hands of a watch until  $R_1$  is stopped by the pinion. During the last part of  $R_1$ 's travel H has turned with it  $S_1$ ,  $S_2$  until  $H_1$  has fallen into the slot of

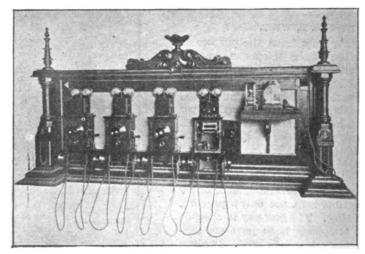
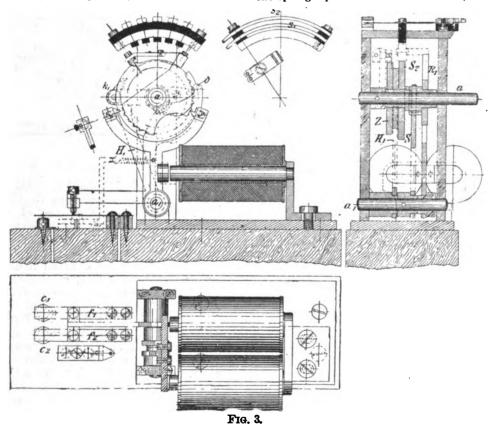


Fig. 4.

ordinary way, while all the other subscribers' apparatus are locked.

This state lasts until disk  $S_2$  has turned about three-fourths of a revolution when the hammer  $H_1$  falling into the larger slot of disk  $S_2$ , the spring  $F_1$  returns into its normal position,



 $H_1$ , the lower arm of which carries two contact springs  $f_1$   $f_2$ , which close the circuit of the small electromotor M and the locking circuit of the battery B referred to above. Thus all the subscribers' apparatus are locked at once. The electromotor M turns the spindle a slowly (one revolution in about two minutes) by means of an endless screw and a toothed wheel r. The arm  $h_1$  and ratchet  $k_1$ , force Z,  $S_1$  and  $S_2$  to follow the revolution of a; thereby  $S_2$  presses the hammer H outwards, and this touching an ivory piece fixed to the spring  $F_1$ , lifts the

thus disconnecting the bell wagain and locking the station I. The subscriber must therefore answer the ring within 1½ minutes, a time which is perfectly sufficient under any ordinary circumstances.

A short time after the hammer H has fallen into the larger slot of  $S_2$ , the small triangular shaped piece of metal q fixed on disk  $S_2$ , reaches the projection o of the segment S, which by the movement of  $R_1$   $r_1$  has been moved to the left, and presses it back again to the position shown in the diagram. Thereby S turns

S1, whereby the circuit of the motor M and the locking circuit have been interrupted. Now the normal position of the apparatus is reached, all the subscribers' stations being unlocked. This unlocking will not take place if the subscriber I answers the ring in due time; in this case the other stations will remain locked by means of the relay R until the subscriber I has finished his conversation. Instead of having one induction coil in each of the subscribers' stations one common induction coil for all stations may be used; then X will be the primary of this coil, while the secondary will be inserted in the wire L<sub>1</sub> between the connection with the electromagnet E and the binding post 3.

Fig. 4 shows the central apparatus and four subscribers' stations fixed together on a panel.

The diagram, Fig. 1, shows clearly that, otherwise than the ordinary contacts of the telephone hook, there are no movable contacts in the speaking circuits, and the function of one apparatus does not depend upon such contacts in the other apparatus. This is one of the advantages of the new system, as movable contacts are the most frequent cause of disturbances in telephone apparatus. The central apparatus alone contains a limited number of movable contacts, which are, however, all in the local circuits of the system. If any disturbance occurs through these contacts-or through any other cause—the result will never prevent the calling up of the central office. From the description the central apparatus may seem to be complicated; nevertheless its construction is most simple and not likely to get out of order. Another advantage of the system (one which renders it extremely easy of adoption) is that no alteration whatever of the boards at the central office is necessary.

The new system has been thoroughly tested by the post office of the German Empire, and is to be introduced very shortly into the German public telephone service.

The citizens of Elkader, Iowa, voted on Tuesday, February 13, to grant a franchise for an electric light and power plant to Messrs. Schmidt Bros. & Co., of that city. The power will be furnished by turbine wheels together with a reserve steam plant. Mr. H. L. Griffith, of Elkader, Iowa, is acting as consulting engineer and will prepare the specifications.

### OUR PARIS LETTER.

(Special Correspondence of Electricity.)

# Electric Lighting at the Paris Exposition of 1900.

The buildings of the Paris Exposition are approaching completion, and none too soon, as the inauguration takes place in two months. Despite this advanced state of affairs it is difficult to give a detailed report of the electric equipments; it will be necessary to wait another month—for the classification of exhibitors—before precise facts can be secured. All the reports published so far by the reviews are only general remarks regarding exhibitors, the placing of dynamos, switchboards, etc. The exhibitors' lists must be closed before definite information is accessible.

It was only a few days ago that the administration informed contractors of the conditions governing electric lighting distribution in the different sections of the Exposition. There evidently will be a great light installation, for arrangement is being made for 15,000 hp. to feed arc and incandescent lamps. This figure, considered as a basis, will certainly be exceeded without any difficulty, as the exhibitors of electric generating apparatus are numerous and they are perfectly well supplied with equipments to answer all the requirements of the electric lighting service, while private illuminating equipments moreover will complete the general installation.

As far as the public electric lighting, properly speaking, is concerned we are able to give figures from which the whole may be rightly estimated. Visitors coming at night will be admitted to the Exposition through the monumental entrance on the Place de la Concorde. They will find on the Champs Elysees 174 continuous current arc-lamps supplied from underground conduits. At the Porte de la Concorde there are 12 large arc-lamps on the cupola of the arch and on the minarets, while 8 projectors and 16 single reflectors are arranged on the turrets, not mentioning the 3,116 incandescent lamps which are distributed everywhere about the arch, Alexander III Bridge will be illuminated by 508 incandescent lamps distributed on the candelabra, on the luminous crowns, on the key-stones of the vault and on the quay-turrets. All these lamps are 16 candle power each, supplied by threephase alternating current generated in the transformer underground stations. On the Champ de Mars, the Palace of Electricity and the Chateau d'Eau (water castle) which face the above monumental arch, will necessarily be illuminated a giorno (as brilliant as day), the former one by 5,000 incandescent lamps, 8 arc lamps with projectors of stained glass and 4 arc-lamps with reflectors, and the latter by 2,000 incandescent lamps. The distribution for all these arrangements has been the subject of deep studies, and the effect produced will never be forgotten.

We must now mention the great banquet hall in the center of the former machinery palace, which is illuminated by 4,500 incandescent lamps; the two palaces of the Esplanade des Invalides, each of which will be illuminated by 1,070 incandescent lamps, and a central passage way between them is to have 25 arclamps while there are 34 in the quincunx, which makes a total of 2,156 lights. These are about the main features of the electric lighting, but there are others of less importance distributed in smaller groups in different localities. We hope to give you soon the general

distribution of the current and the arrangement of the different power stations about the circumference of the Exposition.

#### THIRD RAIL PYROTECHNICS.

# An Unusually Brilliant Display Furnished by the Elevated Motor Cars During the Heavy Storm.

The heaviest snow storm since the blizzard of last year arrived in New York on Saturday morning and continued throughout the day and night. The traction companies were busy with their snow plows and sweepers, and the trolley lines were all kept running, although about eight inches of snow had fallen.

One of the features of the storm was the brilliancy of the display on the third-rail system now in use on the elevated railroads. The "Brooklyn Eagle's" electric reporter furnished the following description of the third-rail display on the Fifth Avenue Railroad of Brooklyn:

"It is not often that the mystic force which propels the cars through the system of motors and copper wires lets itself loose. Usually the brushes which take up the power from the third rail, as the pulley of the trolley pole on the surface lines collects the propulsive current from the overhead wire on the surface lines, proceed with noiselessness and no spectacular attraction. But last night it was different. The lightning leaked from the third rail and whenthe brush came along made a great deal of fuss in dissolving itself, if it is ever dissolved, into the air. The result was that the passengers on the trains on the elevated were treated to a very pretty and to some a very alarming sight. As the brush passed over the third rail there was an electrical display that frightened many of the women in the cars.

"At street crossings, where there was little light, the sputter of brilliant blue and white sparks from the brushes and the third rail lit up the interior of the cars in a way that suggested to the timid that a storm of an unusual character had broken loose. There is always nervousness in some minds over a blinding snow storm, but when the murkiness of the atmosphere is lit up in a startling way with an unusual light there is added cause for fear.

"In the elevated cars there were fitful flashes of brilliant light which sparkled on the windows and cast showy reflections on the advertising boards on the sides of the cars. Many women were frightened, but there was really no reason for alarm. The spectacle was much better appreciated by persons on the street who looked up and saw the rain of sparks than by those who were in the cars.

"The snow formed a filmy covering to the third rail and as the brush of the motor came along it swept the white covering off in a shower. It was like the shower of steel filings in the golden rain of the pyrotechnist, only vastly more brilliant and dazzling. Of course there was no danger at any time and the only losers were the railroad people who had to supply the spent leakage from the rails with added power.

"This was the heaviest snow fall since the third rail system was put into effect and the passengers were not accustomed to the unusual experience."

experience.

"The newspaper readers, especially, were the most annoyed and many of them were obliged to lay aside the favorite journals because at periods all the lights in the cars would go out for a moment or so. The display to the people resembled the almost incessant lightning which usually accompanies a heavy electrical storm in summer. The trains were delayed little in consequence of the snow."

#### LEGAL NOTES.

The Appellate Division of the Supreme Court gave judgment a short time ago in favor of the North River Electrical Light & Power Company in its suit against the City of New York upon an agreed statement of facts, to recover about \$120,000 for furnishing light in the streets of the Borough of the Bronx from January 1 to September 30, 1899. The opinion was given by Justice O'Brien, Presiding Justice Van Brunt and Justice Patterson concurring. Dissenting opinions were given by Justices Ingraham and Rumsey.

Mr. J. K. Newman, president of the New Orleans & Carrollton Railway, and Mr. R. M. Walmsley, president of the Traction Company's lines in New Orleans, were each fined \$10 in the Second Recorder's Court recently for violation of city ordinance No. 13,838. The ordinance is the municipal act compelling the street railway companies to put their feed wires underground. In each case an appeal bond was taken and the validity of the law will be fought in the higher courts.

J. Austin Williams was given a verdict last week for \$6,000 by a jury in the Essex Circuit Court of New Jersey in his suit for \$10,000 damages against the North Jersey Street Railway Company for injuries received on January 31.

# Puzzled by an Electric Display.

To the Editor of ELECTRICITY.

SIR: Probably some of your readers would enlighten me as to the cause of the following electrical display: On the night of Jan. 24, while walking along a country road, I noticed sparks, apparently coming from a gable of a house. Thinking to prevent a possible fire, I notified the inmates, who, upon investigation, found that the sparks appeared on the point of a lightning rod; the lightning rod system contained five points, but the sparks appeared only on one. I am unable to account for this, as the night was clear (bright star-light at the time), there are no wires on that side of the road and only ordinary electric bells in the house. I again saw the same thing on passing the house two hours later. Yours respectfully,

New York, Feb. 7, 1900. D. W.

[Probably other readers of ELECTRICIY witnessed the same display, and we invite them to send us their views of it for publication. Such accounts are always interesting to readers of electrical papers.—Ed.]

# Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended February 10:

Antwerp, 4 cases, \$973: Argentine Republic, 141 cases, \$15,221; Australia, 15 cases, \$420: Brazil, 74 cases, \$3,666; Bristel, 8 cases \$2,500: British Possessions in Africa, 10 cases, \$256: British West Indies, 16 cases, \$5,750; Central America, 2 cases, \$30; Ecuador, 93 cases, \$5,000: French West Indies, 19 cases, \$1,694: Glasgow, 24 cases, \$1,640; Hamburg, 307 cases, \$25,900; Havre, 140 cases, \$10,125; Naples, 1 case, \$48.

## PERSONAL MENTION.

Mr. John Q. Brown, formerly secretary and acting manager of the Columbus (O.) Electric Company, has accepted the position as general manager and purchasing agent of the Electric Street Railway Company of San Antonio, Tex.

Mr. Thomas Rodd, chief engineer of the Pennsylvania Steel Company at Pittsburg, and consulting engineer of the Westinghouse interests, sailed for Europe a short time ago taking with him the plans for the new plant of the British Westinghouse Company at Manchester England.

Mr. John J. Cummins was recently elected general manager of the Syracuse (N. Y.) Electric Light Company, and the Gas Company. It is stated that the consolidation of the two companies is sure to come in time.



#### COMMERCIAL PARAGRAPHS.

The Chicago Fuse Wire & Mfg. Co. have just issued their Fuse Wire Catalogue No. 11. This booklet is of convenient pigeon hole size and is gotten up in neat style, as is customary with this company. Attention is called to the fact that they have made some additions in this issue, in the way of information about their line and method of packing, and have included extracts from the rules of the National Board of Fire Underwriters relating to the use of fuse wire and links. The product of the Chicago Fuse Wire & Mfg. Co has been well and favorably known for many years. Their goods are sold through the prominent jobbers and dealers in electrical lines. The Catalogue No. 11 will be sent free to all applicants.

#### Universal Junction Boxes.

In the wiring of buildings for electrical illumination, transmission of power, etc., there are many conditions that necessitate the use of individual junction boxes constructed especially for such emergencies. The latest invention, and one best adapted to all purposes, is the Universal Junction Box, just brought out by the Sprague Electric Company, and

or ceiling by a screw or nail, without the danger of being broken by a false blow. In fact, it would be impossible to break it in such a manner.

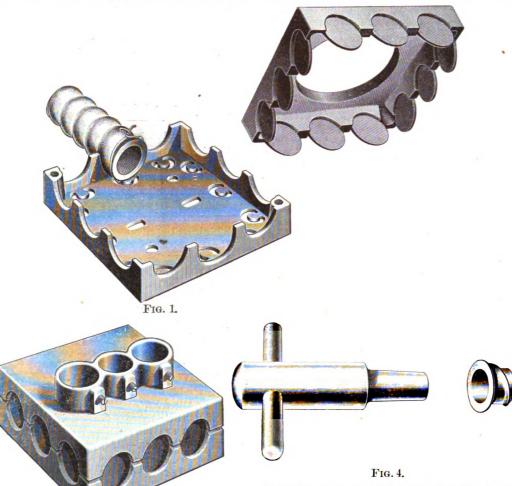
Fig. 4 shows the new lead bushing and expanding tool which the Sprague Electric Company is now making, The bushing has a thread cast on the outside and can be screwed into the end of the pipe and then expanded by inserting the expanding tool and giving it a few short twists to the right and left, but never turning it completely around.

### INCORPORATIONS.

The Edison-Johnson Electrical Manufacturing Company, New York City—to deal in electrical apparatus. Capital stock, \$75,600. Incorporators: T. A. Edison, Jr., E. G. Johnson, both of New York City, and W. A. Elliott of Cornwall, N. Y.

The Home Electric Street Railway Company, Kansas City, Mo. Capital stock, \$50,000. Incorporators: B. Corrigan, R. Gentry and J. Perry.

The Merchants' Light, Heat & Power Company, Youngstown, O .- to furnish are and incandescent light, heat and



power; to purchase and sell electric supplies and to carry on a general electric contracting business and other things incidental thereto. Capital stock, \$55,000. Incorporators; Henry F. Kaercher, David F. Anderson, George E. McNab, William R. Beard and Paul C. Kaercher.

The Cheatham Electric Switching Company, Louis ville, Ky.-to manufacture and sell a patent electric switching device for railroads. Capital stock, \$70,000. Incorporators: A. B. Cheatham, Peter Arlund, C. P. Todd and H. T. Sutton, all of Louisville.

The Manhattan Light, Heat & Power Company, St. Paul, Minn.—to manufacture and sell electricity and steam. Capital stock, \$1,000,000. Incorporators: L. L. C. Brooks, A. W. Zahn and F. C. Nelson, all of St. Paul.

The Citizens' Electric Light, Power & Heating Company, Dayton, O. Capital stock, \$200,000.

The Mount Pleasant Electric Company, Mount Pleasant, Tenn. - to manufacture electricity, etc. Capital stock, \$15,-000. Incorporators: E. L. Gregory, O. Ingram, J. G. Ingram, H. D. Rahm and J. Rahm, all of Nashville.

The Morgan Engineering Company, Alliance, O.-to manufacture hydraulic, electric, pneumatic, gas and fire machinery, including guns and ordnance. Capital stock, \$3,000,-

The Novelty Machine & Electric Company, Wheeling, W. Va.-to manufacture and deal in typewriters and typewriters' supplies. Capital stock, \$50,000, Incorporators: R. E. Schubert, C. Menkemiller, G. E. Kumer, H. G. Friedrichs, A. H. Wiedebusch, all of Wheeling.

ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N.W., Washington, D.C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subjert as well as printed publications containing all information regarding the cost of United States and Foreign Patents Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 503-504, Broadway, New York City. N. Y., or 639 F street, N.W., Washington, D. C.

Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

#### LETTERS PATENT ISSUED FEBRUARY 13, 1900.

#### ELECTRIC RAILWAYS AND APPLIANCES.

643,199. Car-Fender. Edward N. Porter and Junius Barnes, Burlington, Vt. Filed April 13, 1899.
643,276. Electric Traction-Motor. Charles Richter and Richard T. Eschler. Camden, N. J., assignor to the Security Trust and Safe Deposit Company, trustee, of New Jersey. Filed May 19, 1899.
643,491. Electric Flashing Switch. Ambrose L. Cotter, Cleveland, Ohio, assignor to E. L. Browne, same place. Filed Sept. 15, 1899.
643,591. Trolley. William G. Holmes, Roseville, and Henry Holland, Detroit, Mich. Filed March 31, 1899.

#### ELECTRICAL MACHINERY AND APPARATUS.

643,413. Electromagnetic Variable-Speed and Clutch Gearing. Rankin Kennedy, Leeds, England. Filed Feb. 20, 1899.

1899. 643,442. Controller. Thorsten von Zweigbergk, Cleveland, Ohio, assignor to the Westinghouse Electric & Manufac-turing Company, Pittsburg, Pa. Filed March 31, 1899.

#### SIGNALS AND SIGNALING APPARATUS.

643,148. Electric Signal and Automatic Alarm for Railway
Trains. James K. Miller, Julius W. Witt, and Daniel A.
Jones, Oshkosh, Wis. Filed July 13, 1899.
643,255. Electrically-Operated Day and Night
Railways. John J. Saville and James H. Winspear.
Omaha, Neb., assignors to the Standard Railway Signal
and Switch Company, same place. Filed Aug. 13, 1898.
643,491. Pyroxylin Automatic Electric Fire-Alarm. Jehan De
Froment, Notre Dame de Lourdes, Canada. Filed July
25, 1899.

26, 1899. Railway Signal Apparatus, Charles R. Gur and Herbert Tomling. London, England. Filed Sept. 21, 1899. 643,609. Signalmg System. John J. Ruddick, Newtown, Mass., assignor to the United States Electric Signal Company, same place and Portland, Me. Filed Aug. 16, 1899.

# TELEPHONES AND TELEPHONE APPARATUS.

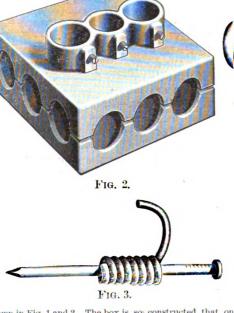
643,225. Telephonic Repeater. James Houlehan, Toledo, Ohio. Filed Sept 14, 1899. 643,399. Device for Disinfecting Telephones, etc. Warren H. Taylor, Stamford, Conn. Filed March 9, 1899. 643,545. Telephone-Telegraph. Alf Sinding-Larsen, Fred-riksvaern, Norway. Filed Aug. 22, 1899.

## MISCELLANEOUS.

riksvaern, Norway. Filed Aug. 22, 1899.

MISCELLANEOUS.

613, 133. Safety Device for Electric-Distribution Systems. Edward M. Hewlett, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Jan. 3 1899.
643, 156. Plant for Operating Motors. Miles W. Quick, Titusville, Pa. Filed Oct. 19, 1898.
643, 162. Alternating-Current Meter. Gustave A. Scheeffer, Peoria, Ill., assignor to the Diamond Meter Company, same place. Filed May 11, 1899.
643, 179. Thermostatic Apparatus. Edward F. Woodman, Boston. Mass. Filed May 11, 1899.
643, 183. Phonograph. Gianni Bettini, NewYork City. Filed May 12, 1897.
643, 206. Carbureter. Waterman S. C. Russell, Manchester, Mass. Filed May 31, 1899.
643, 228. Means for Controlling and Indicating the Supply of Electric Energy. Cesar R. Loubery. Paris, France, assignor to himself, Emanuel Francois and Henry Kunkelmann, same place. Filed May 23, 1899.
643, 254. Electric Furnace, Albert J. Petersson, Notre Dame de Briancon, France, assignor to the Societe des Carbures Metalliques. Paris. France, Filed April 5, 1898.
643, 257. Motor-Carriage. Elmer A. Sperry, Cleveland, Ohio. Filed Sept. 11, 1899.
643, 363. Automatic Lubricator. Roch S. O'Brien, Providence, R. I. Filed Nov. 20, 1899.
643, 363. Automatic Lubricator. Roch S. O'Brien, Providence, R. I. Filed Nov. 20, 1899.
643, 363. Automatic Lubricator. Roch S. O'Brien, Providence, R. I. Filed Nov. 20, 1899.
643, 364. Filed Sept. 11, 1899.
643, 393. Filed Sept. 13, 1899.
643, 393. Electric Meter. John H. Barker and James A. Ewing, Cambridge, England. Filed Aug. 14, 1899.
643, 397. Carbureter. Stephen Broichgans, Milwaukee, Wis. Filed March 23, 1899.
643, 399. Celectric Meter. John H. Barker and James A. Ewing, Cambridge, England. Filed Aug. 14, 1899.
643, 525. Motor for Vehicles. Leberty Clock. Henry J. Cosgrove, same place. Filed Oct. 5, 1899.
643, 525. Motor for Vehicles. Abraham Olson, Minneapolis, Minn. Filed Aug. 3, 1899.
643, 525. Motor for Vehicles. Abraham Olson, Minneapolis, Minn. Filed Supr. Washington, D. C. a



shown in Fig. 1 and 2. The box is so constructed that one, two or more inleading conduits may be put in place by knock ing one or more tongues, making the requisite openings in the box. The bottom of the box has perforations permitting a wire to be inserted to tie the conduit in place while the work is in progress. This is a very important feature, and saves much time and expense.

These boxes may be applied either to ceiling or wall wherever a gas-piped passes through without the use of ceiling or wall blocks, or other means of attachment now ordinarily used.

The ceiling box, shown in Fig. 2, can be secured to the gas-

Fig. 3 illustrates a new type of pipe hook made by the same company, and has the advantage of being secured to the wall



# GENERAL NEWS.

What is Going On in the Electrical World.

#### LIGHTING.

Abbeville, La.—H. P. Porter, secretary of a company recently formed here, wants 1,500 light dynamos, boiler and engine to suit, wires, lamps, etc.

Adairville, Ky.—The question of electric lighting is being considered here.

Centerville, Ia.-Law Bros. of this city have asked for a franchise to maintain and operate an electric light

Clearlake, S. D.—An electric light plant will be erected here this season.

Dalton, Ga.—J. M. Sanders, chairman of the light committee, wants estimates on the cost of an electric light plant for a town of 6,000 inhabitants.

Duluth, Minn.—The proposition to build a city electric light plant was carried at the recent election

Easton, Pa.—The question of erecting a municipal electric lighting plant is being discussed here.

Fairport, N. Y.—The question of building an electric light plant will soon be voted upon.

Freehold, N. J.-An electric lighting company is seeking a franchise here.

Hedrick, Ia.—The town council has under considera-tion the building of an electric light plant.

Ilion, N. Y.—There is a movement on foot that this village shall own and operate its own electric light

Index, Wash.—J. H. Mitchell and Harry Hoback have been granted a franchise by the Snohomish county commissioners to erect and operate an electric light plant in this village.

plant in this village.

Kingman, Kan.—An electric light plant has been planned for the salt mines near this place, for the purpose of lighting up the entire system throughout the building, inside the shaft and down in the mines, a thousand feet under the ground. A set of electric signals will be arranged to connect all the works, so that every department will be in instantaneous communication in case of possible accident or danger.

Knowilla Tana.—The Fact Wayne Flactric Com-

Knoxville, Tenn.—The Fort Wayne Electric Company will install a lighting plant here.

La Grande, Ore.—J. K. Ronig has lately made arrangements to double the present capacity of the electric light plant in this place.

Laurel, Miss.—The Kingston Lumber Company will rebuild its planing mill, and also put in an electric plant to run their mills night and day.

Lawson, Minn.—A new electric light plant will soon be erected here.

Little Falls, N. Y.—Isaac Lovenheim has asked permission to construct an electric light plant in Mill street and place poles if necessary for wires in Main, Mill, Albany, Second and John streets.

Loveland, Col.—A company is being formed here to build an electric light plant.

Madison, S. D.—The electric light plant at this place is to be enlarged to double its present capacity. About \$8,000 will be expended in improvements.

Newton, Kan.—The Santa Fe Railroad Company contemplates the erection of new electric light plants at Newton, Kan.; Albuquerque, N. M., and Winslow, Ariz. These electric light plants will furnish light, etc.

New Wilmington, Pa.—An election will be held this

week to wind the question of issuing bonds for an electric light plant. J. G. Martin is secretary.

Norristown, Pa.—The Norristown Electric Company will soon receive bids for erecting a new electric light

North Hempstead, N. Y.—The board of highway commissioners of this town has granted to the Roslyn Heat, Light & Power Company permission to erect poles and string wires along the town highways for the purpose of supplying light, heat and power to private and public consumers.

Plattsburg. Mo.—The citizens here are discussing the matter of buying the electric light plant.

Pleasantville, N. J.—The electric light committee states that they have considered the various propositions for lighting the borough and will submit them at the open town meeting for the consideration of the people.

Rayne, La.—A project is on foot by the business men of this place to erect an electric light plant and water works for this town.

Salisbury, N. C. —Bids will soon be asked for by this ity for erecting an electric light plant.

Sayville, N. Y.—There is a strong sentiment among the Sayville merchants in favor of establishing an electric light plant here.

Sonecs Falls, N. Y.—A mass meeting will be held here to consider the establishment of municipal waterworks and electric lighting system.

Shamokin, Pa.—Plans have been formulated by the Shamokin Light, Heat & Power Company for the erection of a plant here to replace the two now in operations

Thorntown, Ind.-The town board has decided to

submit the question of a municipal electric light plant at the regular town election in May.

Two Rivers, Wis.—The citizens of this place have voted in favor of waterworks and an electric light system. The estimated cost of the two plants will be

with about \$60,000.

Victor, N. Y.—If the proposed Canandaigua-Rochester electric road is built, efforts will be made to have this village lighted by electricity.

Washington, Ind.—The question of a municipal electric light plant is being considered by the committee composed of J. F. McGehee, chairman, and O. Wolf, with aleast of the control of the city clerk.

Waterloo, Ind.—This town is agitating the question of erecting an electric light plant.

Wayne, Mich.—This village is considering the advisa-lity of building a municipal electric lighting plant.

Wellesley, Mass.—A committee has been appointed to secure plans and estimates for a municipal electric lighting plant.

Wichita, Kan.—W. B. McKinley has been granted permission to build an electric light plant before July 1. Winston, N. C.-An electric light plant is to be erected here.

#### STREET RAILWAYS.

Adrian, Mich.—It is proposed to build an electric road from Toledo here. The Toledo & Western Company being the organization back of it. Seafraves Brothers are the promotors, and Adrian will be one branch of the main line which runs west from Toledo to Lyons, O.

Appleton, Wis.—The Fox River Valley Electric Railway Company has purchased the property of the Appleton Edison Electric Company, which includes an electric road two miles long and the entire city lighting system. The line will probably be rebuilt.

Atlanta, Ga.—A charter has been issued to the Atlanta, Roswell Electric Railway & Power Company with \$500,000 capital, to build a railway from this city to Roswell, a distance of about 20 miles. W. H. Harrison

Baltimore, Md.—The Maryland Electric Railway Company has asked for a franchise to build an electric line in the city and suburbs. Messrs. L. L. Strauss and A. P. Gorman are counsel for the company.

Battle Creek, Mich.—Geo. Bullis, representing the Detroit and Ann Arbor stockholders, has asked for a franchise from the common council for an interurban electric road to run between Hastings and this place.

Bloomsburg, Pa —The surveying for the electric railway between Danville and Berwick via this place has been commenced. B. F. Myers is the president of the company.

Chattanooga, Tenn.—The Bapid Transit Company of this city will soon build an electric line 4½ miles in

Cumberland, Md.—The Baltimore & Ohio Railroad Company has under advisement a plan to assist heavy trains up the 17-mile grade by electricity, and to do away with helping engines. It is thought the power will be generated here.

Denver, Col.—The Denver, Boulder & Northern Bailway Company is seeking the right to run an electric line in this city as well as one to Boulder.

Elyria, O.—This place will soon be connected with Mansfield by an electric road.

Hamilton, O.—The Camden council has granted a franchise to the Hamilton & Eaton Electric Street Railway.

Hubbard, O.—The Youngstown & Sharon Electric Railway Company wants a franchise through this place.

Milford, Mass.—A company has been organized for he purpose of connecting Milford, Upton and Grafton Mass.—A company of connecting Milford, Upton and Grane vio railway. The length of the line is to be the purpose of connecting by an electric railway. 12½ miles.

Omaha, Neb. -C. M. Searles, of Sidney, Ia., has been omans, Neo.—C. M. Searies, of Sidney, Is., has been negotiating with the commercial club and others for the construction of an electric railroad with the southern terminus at Hamburg, Is. The proposed road will run from Hamburg through Tabor, S.dney, Glenwood and Silver City. the intention being to connect it with Council Bluffs and Omaha. The road as planned will be about 50 miles in length.

Phoenixville, Pa.—A trolley line from this place to Bridgeport is the latest proposition in that method of travel. Several capitalists have called upon John L. Hay, through whose property at Valley Forge the road would pass, with a view of obtaining the right of way.

Pottstown, Pa.—The freeing of a large portion of the Perkiomen & Reading turnpike in Montgomery county lately is regarded as being the preliminary step toward building a trolley line connecting Norristown with this place, and eventually, Reading and Philadelphia.

Traverse City, Mich.—An electric road is now assured from this city to Northport, a distance of 30 miles. The company is organized as the Traverse City & Leelenan Bailroad Company, with a capital stock of \$300,000. The road will touch all the popular resorts in this section.

Troy, N. Y.—Surveys are being made for the new trolley line from this city to Williamstown. The road as now planned is 30 miles in length.

Warrensburg, N. Y.—The Warren County Railroad Company has been granted permission by the State board of railroad commissioners, to construct a trolley line from Caldwell to this place.

Warsaw, Ind.—A tranchise has been asked for by A. D. Biggs and associates to build an electric railway through this city from North Detroit.

West Orange, N. J.—Indications are that the Erie Railroad may adopt electricity for a motive power on its Orange branch between here and Forest Hill, and Orange and Maplewood Traction Company so that company will haul freight and probably coal into Orange Valley and South Orange.

#### COMPANY MATTERS.

Brooklyn, N. Y.—Last week the Brooklyn Navy Yard building, No. 7, was wrecked by fire. The damage to the electrical apparatus stored on the first floor was \$50 000.

Denver, Col.—The Avon Mining, Milling & Power Company will erect a 200 ton concentration works at Black Hawk, and put in an electric power plant of 1,000 horse power in addition to opening up a large number of properties that have been closed down for some time and developing new claims. The prime movers in the concern are: R. W. Cokell, of the American Exploration Company, H. L. Martin, C. L. Martin and others from the East.

Georgetown, D. C.—The Potomac Electric Power Company proposes to begin at an early date the enlargement of the steam electric plant, and to increase the plant by putting in two 3,000 horse-power machines.

Merrill, Wis—The Electric Rsilway & Lighting Company of this place, has a large amount of surplus power from the water wheels in the lighting plant, which is to be used in operating a pulp mill for the purpose of crushing pulp wood.

Milltown, N. J.—Fire recently destroyed the car-sheds. 22 cars and 2 sweepers of the Brunswick Trac-tion Company in this place.

New York.—The Cousolidated Railway, Electric Lighting & Equipment Company of this city recently purchased the plant of the hardware manufacturers, Wilcox & Howe of Ausonia, Conn., for \$15,000.

Port Clinton, O.—The new Tiffin, Toledo & Sandusky Electric Railway Company is preparing to erect a large power house at this place.

Santa Aua, Cal.—The Edison Electric Company will apply electricity to this place generated by Santa lara River power in the San Bernardino Mountains, 100 miles away.

Toronto, O.—The Toronto Electric Light & Power Company has ordered new machinery and will build a much larger plant in a new and more convenient location next to the ice plant.

Yardley, Pa.—The People's Electric Light Company of this place has sold its electric light plant to a party of Trenton capitalists.

## POWER AND TRANSMISSION PLANTS.

Atlantic City, N. J.—It is reported that the Delaware River & Atlantic Trolley Company has secured the old Colwell mill property, with the water power rights at Weymouth, Atlantic county, where it proposes locating a power plant, as it is claimed that sufficient power can be developed there to make all electricity needed for the road.

Pine City, Minn.—Recent transactions in real estate render it certain that the great water power at Cheng-watena dam will be utilized the coming season. This power is the most constant of any in the State. The power is the most constant of any in the State. The flowage of the dam covers an area of nearly fifty square miles, affording an immense reservoir. This power will be used to operate the electric light plant of this city, and also to furnish power for a new enterprise about to be started.

## AUTOMOBILES.

Cumberland, Md.—Swift & Company of this place are the owners of the first automobile seen on the streets of Cumberland. It is used as a delivery wagon.

New Britain, Conn.—A scheme is well under way to run large automobiles, carrying twenty passengers, from this place to Hartford and from there to Union-ville. The capitalists interested in the matter have sent a committee to New York City to examine vehicles of different makes.

New York.—It is stated that the second lecture in the series being given on automobile topics, under the auspices of the Automobile Club of America was delivered a short time ago at the Waldorf-Astoria, by Mr. A. L. Riker. The subject was "Electricity as Applied to Automobiles."—The initial trip of the new auto-ambulance of St. Vincent's Hospital was made last week, going from St. Vincent's to Bellevue Hospital. Dr. Farrell, of St. Vincent's Hospital, was in charge. The auto-ambulance can be geared to eighteen miles an hour. It can accommodate two patients exily.

Peterson N. I.—Members of the Union Transit New York.—It is stated that the second lecture in the

nour. It can accommodate two patients ewily.

Paterson, N. J.—Members of the Union Transit
Company say that the franchise has been given them
to operate automobile carriage service in this city.
Orders will be placed at once for the building of the
automobiles and it is expected to have a number of
them running in May or June at the latest. The
vehicles will be made in Connecticut.



# THE TELEPHONE WORLD.

#### Telephone War in Prospect.

There can be little doubt that Philadelphia is on the verge of one of the greatest telephone company wars that has ever been waged. Since the days when the great Bell Telephone Company gained a monopoly and began to pay immense dividen is there has been a constant effort made to wrest from them their ability to control the telephone business of the country, and the eyes of capitalists have been constantly upon the lookout for an opportunity to get in on the ground floor of this money-making enterprise.

In less than a year the last remaining patents of the Bell Telephone Company will have expired and then the war will be on in earnest. All through Pennsylvania small companies have started up and are already conducting their business under charters granted by the State. Others are seeking and obtaining charters. They are also selecting sites for the erection of suitable buildings to conduct their business, but they are apparently in no hurry to commence.

Those who are more familiar with the telephone business declare that these charters are obtained on a speculation basis only. That when the times comes for the Bell Telephone patents to expire some large concern will enter the field only to find that several small charters have been granted for cities, territories or States that they will first have to purchase in order to gain control of the business.

The officers of the Telephone, Telegraph & Cable Company of Pennsylvania, declare that they are in no way connected with the Inter-State Telephone & Telegraph Company, therefore, there are at least two rival companies already in competition for the control of Pennsylvania alone. Each company sets forth that they will not only control the lines of Pennsylvania, but those of the States adjoining, so that it is evident that a clash must come sooner or later. When it does the war will be a merry one, and afford one of the greatest fields for speculation yet offered, at least, this is the opinion of the knowing ones.

#### To Fight the Bell.

A meeting of the Interstate Telephone Association, comprising all the independent telephone people in southwestern Missouri and eastern Kansas, has been called to meet in Fort Scott on April 10 for the purpose of more thoroughly organizing against the Bell Telephone Company. A number of independent long distance lines are included in the association, and it is understood that arrangements will be made for better co-operation between these and also for securing a line to Kansas City. The nearest point to Kansas City on the independent long distance lines is Ottawa.

J. C. Duncan, general manager of the People's Telephone & Telegraph Company of Knoxville, Tenn., reports that his company does not propose to give up the territory in upper East Tennessee, beyond Morristown, to the East Tennessee Telephone Company, but that as soon as a new line can be constructed from New Market and Mossy Creek, the People's Company expects to re-enter that field with a better toll line service than they have ever had before. This statement indicates that there will be continued opposition between the two rival companies in upper East Tennessee territory during the coming spring and summer, possibly to a greater extent than ever before.

It is reported that the Bell Telephone Company has men at work obtaining the right of way for a new telephone line from Niagara Falls to Lockport, N. Y., through Sanborn, The average price paid for the right of way past each person is said to be \$1. A third of the right of way has been obtained between the Falls and Sanborn, and all but ten of the farmers between Sanborn and Lockport have given permission. Ten or more 'phones will probably be put in at Sanborn, with a central office at that place, and a branch will also be built to Pekin.

In the Assembly at Albany Mr. Prince, of New York, has introduced a bill to prevent the erection of any more telephone, telegraph or electric poles in cities of 50,000 inhabitants or over, except such as are now or may hereafter be erected and maintained in connection with an underground system of wires. The independent telephone men intimated plainly that the bill emanated from the Bell Company or its friends, and that it is purposely designed to handicap rival companies in New York City. The Bell Company largely controls the subways, and the bill would give it the exclusive right to maintain poles in the suburbs. The independent men, however, are not asleep, and they will take steps to head off the bill.

There is a possibility that the trouble between the retail druggists of Minneapolis, Minn., and the Northwestern Telephone Exchange Company may be arbitrated. Certain members of the board of trade have suggested that means of settlement, and it is understood that the managers of the telephone company will consider that side of the question.

#### Telephone Officials Confer.

J. M. Thomas of Chillicothe, Ohio, president of the Independent Telephone Association of the United States, was recently in consultation with Hugh Dougherty of the Independent Telephone Company and others interested in the Telephone, Telegraph & Cable Company of America.

Telephone, Telegraph & Cable Company of America.

"The Association is growing like a rolling snowball during a thaw," said Mr. Thomas. "The New York Company will build as far west as Cleveland, where it will connect with the Western lines. The Kinlock Company of St. Louis, the Illinois Telephone & Telegraph Company of Chicago, and practically all the independent telephone companies of the West will become a part of the Independent Telephone Association of the United States. When the deal is completed we will cover a large portion of the country, and have a system almost perfect in all its departments."

#### Sold to the Cumberland.

The People's Telephone Company of New Orleans has finally been sold to the Cumberland Telephone & Telegraph Company.

The stockholders, of whom there were only ten or a dozen all told, were principally Detroit men. Negotiations looking to this consummation have been under way for some time.

Those interested do not state what price they received for their stock, but admit that they made some profit on the investment. It is now stated that it is a matter of only a few days before the Detroit Switchboard Company will be sold to the same parties.

The price paid was \$425,000 for all bonds and stocks. This takes in everything, with the exception of \$110,000 bonds sold abroad. The Cumberland Company has agreed to take these at par whenever offered.

# Annual Meeting of the Central New York Telephone Company.

The Central New York Telephone & Telegraph Company held its annual meeting last week at the offices of the company in the Mann building, Utica. President Lewis H. Lawrence occupied the chair.

The president's report showed the following: The gross revenue for the year was \$251,060.93; the gross expenses were \$200.589.23; net revenue, \$41,471.70. Compared with the year 1898 this shows there was an increase of gross revenue of \$16,974.40; an increase of gross expenses of \$19,900.50; a decrease of net revenue of \$2,926.10.

The revenue from the toll lines shows an increase over 1898 of \$5,418.87.

The total number of exchange subscribers December 31, 1899, was 4,457, a gain of 444 during the year.

The usual annual dividend of 6 per cent on the issued capital stock was declared and paid quarterly.

A new telephone system will be constructed this spring to operate in Glens Falls, Sandy Hill, and Fort Edward, N. Y., having connection with Troy and vicinity, seventy five towns in Vermont and the towns west of Lake George. Charles W. Forbes of Chicago is at the head of the enterprise. The proposed capital is \$120,000. A franchise has been obtained from the village of Fort Edward and similar grants it is expected will be received from other villages. The new company will connect with other new companies which are being organized throughout New York State.

The Troy (N. Y.) Telephone & Telegraph Company have elected the following directors: George P. Ide of Troy, W. C. Humstone of New York, Charles A. Tinker of New York, William S. Earl of Troy, C. Jay French of Boston, Mass., C. H. Irwin. of New York, Alba M. Ide of Troy, James F. Cowee of Troy and Jeffries Wyman. The following officers were elected: President, George P. Ide: vice-president, Charles A. Humstone of New York; second vice-president, Alba M. Ide; secretary and treasurer, Herbert J. Richmond.

Papers have been signed transferring the franchise and plant of the Oshkosh (Wis.) Northwestern Telephone Company, exclusive of office fixtures, to the Erie Telephone Company of New York, representing the Wisconsin Telephone Company of Milwaukee. The Oshkosh company has 5¼ subscribers and it is understood the purchase price is about \$50,000. The Wisconsin Company will operate both exchanges for the present. The sale includes an agreement not to raise rates above \$24 and \$36 for five years.

The Chicago Telephone Company will, in accordance with the authorization of the shareholders, issue \$1,000,000 of new capital at par. One half is payable April 5 and the other half October 5. The old officers were re-elected, with Mr. John M. Clark president and Mr. Byron I. Smith vice-president,

# Congress' Aid Invoked to Break Up a Monopoly.

A strong effort is being made to kill the monopoly now enjoyed in Washington by the Chesapeake & Potomac Telephone Campany, which is controlled by the Bell Telephone Company. Congress attempted to regulate the prices to be charged by this company, and passed a law making the maximum rate \$50. A decision of the local courts declares this law inoperative, practically saying that the company can fix whatever prices it wants and Congress cannot interfere. A new company is now knocking at the doors of Congress for permission to enter into competition with the existing company. A bill has been presented for that purpose which has the approval of the District Commissioners. The name of the company is the Washington Telephone & Telegraph Company, and it agrees to give a service at the rate of \$36 per year for residence telephones and \$48 per year for business telephones.

#### New Telephone Line for Pittsburg.

The Pittsburg & Allegheny Telephone Company, the new concern which is to compete in Western Pennsylvania with the Bell Telephone monopoly, has secured the passage of an ordinance through the Allegheny Select Council by a vote of nine to five, permitting the company to operate on the north side of Pittsburg.

When the Detroit and New State Telephone Companies have been consolidated with the Michigan Telephone Company, the latter will have a great deal of property on its hands which it will be obliged to destroy. This will include the Detroit switchboard and about 12,000 telephones. Under its agreement with the Bell Telephone Company, the Michigan Company uses Bell instruments for which it pays an annual rental of \$1.50 each. This agreement forbids the use of any other instrument. The instruments that have been used cannot be sold to any other company, and the only thing to do is to burn them, and this will be done. An original investment of about \$60,000 will go up in smoke.

The Interstate Telephone & Telegraph Company of Allentown, Pa., which was lately incorporated with a capital stock of \$2,000,000 for the purpose of connecting local telephone companies in Pennsylvania, New Jersey and Delaware, has elected the following officers: C. W. Kline, of Hazleton, president; Dr. C. A. Eisenhart, of York, vice-president; A. M. Worstall, of Philadelphia, secretary; Major Thomas Daugherty, of Allentown, treasurer.

President Hill, of the Muskegon (Mich.) Independent Telephone Company, has signed a contract with Vice-President Pettengill of the Erie Telephone system covering the transfer of the Independent Company to the Erie system before the close of the month. The company operated 600 subscribers and the long-distance line connecting Muskegon with Grand Rapids and several other sections of Western Michigan. The financial consideration is not known.

After three years' efforts to get a franchise in Scranton, Pa., for a company to oppose the Bell Telephone Company, the select council granted a franchise to the Lackawanna Telephone Company, and it was immediately signed by the mayor. The officers of the company are W. J. Lewis, president; A. P. Bedford, vice-president; S. E. Weiland, secretary and treasurer; directors: Reese G. Brooks, ex-Mayor W. L. Connell and ex-Sheriff Charles Robinson.

A certificate of an increase of capital stock of the Bell Telephone Company, of Buffalo, N. Y., from \$2,000,000 to \$5,000,000 was filed last week with the Secretary of State at Albany. The debts of the company, it asserts, are not to exceed \$500,000. The certificate is signed for the stockholders by Sherman S. Rogers and William H. Watson.

The village trustees of Salem, N. Y., have granted a franchise to the Granville Telephone Company to erect and maintain a telephone system in Salem. The franchise provides that the permit shall not interfere with any other franchise already in force.

The Hampden (Mass.) Automatic Telephone Company has petitioned for a franchise throughout the county. Capital stock, \$300,000. The company promises a yearly rate to business houses not exceeding \$48, and to residences a rate not exceeding \$25.

A Tonawanda (N. Y.) paper warns the Bell Telephone Company if it does not get down to business and make a "substantial reduction of rates" it will get no franchise and "some other company will get the chance in North Tonawanda."

The capital stock of the Michigan Telephone Company is to be increased from \$2,500,000 to \$10,000,000.



# ECTRICA SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electricaty from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; tmp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

# STOCKS.

PASSE	NG	ER R	AILW	AYS.			PASSE	PASSENGER RAILWAYS.							
	1	Capital	Stock.						Capital :	Stock.					
NAME.	Par	Authorz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Authorz'd	Issued.	Bate and Date of Last Div.	Bid.	Asked		
Albany, N Y. Feb 19 United Traction (Consolidation of the Albany and	100	2,000,000	81,750,000	1½ % Q., Nov. '98	. 129	131	Hartford Conn.—Feb 19: Hartford Street Ry. Co	100	\$4,000,000 1,000,000	\$200,000 247,000	3 % 8., Oct., '98.	145	1		
Troy City Railway )							Holyoke Mass.—Feb 19. Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June, '98.	200	2073		
Allentown Pa Feb 19	1-	4 000 000	1,500,000			15	Hoboken, N. JFeb 19	95	1 950 000	1 000 000	9 % 1000	150			
Allentowa & Lehlgh Val. Trac Oo Bridgeport, Conn-Feb 19.		4,000,000	1,500,000			10	North Hudson Co. (N. J.) Ry. Co Indianapolis, Ind-Feb 19.	25	1,250,000	1,000,000	8 %, 1892	100			
Bridg eport Traction Co	100	2,000,000	2,000,000	1 % Aug. '98	103		**Citizens' Passenger Ry		5,000,000	5,000,000		27	28		
Baltimore, Md Feb 19 a United Railways & Elec. Cocom	. 50	24,000,000	13,000,000		163	17	Lancaster, Pa.—Feb 19 Pennsylvania Traction Co		10,000,000				-		
Boston, Mass Feb 19	25	5,000,000	1.081.025	1 % Q., Jan.15, '99			West End Street Railway			87,500		::	=		
North Shore Traction Cocom North Shore Traction Copfd b West End Street Ry. Cocom	100	4,000,000 2,000,000 10,000,000	4.000.000		15	16 87 98	Louisville Ry.—Feb 19: Louisville Ry	100 100	4,000,000 2,500,000	8,500,000 2,500,000	1½ %., April '98, 2½ % S., Oct. 1, '98	683	69		
West End Street Ry. Co8 % pfd Boston Elevated R. R		6,400,000	6,400,000	21/4 % Aug. 98,	112 102	114 104	Minneapolis, MinnFeb 19	100		15 010 000		633/	601		
Brooklyn N. Y Eeb 19	100	2,000.000	1,928,400		237	239	Twin City Rapid Transitcom Twin City Rapid Transit7 % pfd		17,000,000 8,000,000	1,712,200	15/4 %, Oct., '98.	186	187		
Brooklyn Rap. Transit Uo., tr certi. «Brooklyn Heights Railroad *dBrooklyn City RRguar	100	20,000,000	20,000,000 200,000 12,000,000	8½ % Q., Jan., '99	73 107 287	78 ½ 109 289	Montreal, CanadaFeb 19: Montreal Street Ry. Co Toronto Street Ry. Co	100		4,000,000 6,000,000	8 % S., M. & N. 134 % S., J. & J.	294 102½	267 1083		
eBrooklyn, Queens Co. & Sub. RB. coney Island & Brooklyn RB Sings County Elevated	100		1,884.200	2 % % Nov., '98.	3 35	::	Memphis TennFeb 19:	100	F00 000	F00 000		25			
Kings County Traction Co Nassau Electric Railroadpfd.	100	4,500,000 6,000,000	4,500,000 6,000,000	1 % July 26, '97	76	77	Memphis Street Railway Co New Haven, ConnFeb 19.	. 100	500,000	500,000		23	-		
Atlantic Avenue Railroad Brooklyn, B. & W. E. Railroad	50		2,000,000		::	::	Fair Haven & Westville RR New Haven Street Railway Co	. 100	1,250,000	2,000,000	8 % S., Sept. '98. 2½ % A., July '96.	46	=		
Builalo N. YFeb 19: suffalo & Niagara Falls Elec. Ry	100	1,250,000	1,250,000		74	75	New Haven & Centerville Winchester Avenue RR			800,000 600,000		47	=		
*Ruffalo Railway Co		6,000,000	5,870,500	1 % Q. Dec., '98.	100	102	New Orleans, La.—Feb 19: Canal & Claiborne RR. Co	40	240,000	240,000	4 % S., July, '98.		1		
Columbus O.—Feb 19 columbus Street Railroad Oolumbus Street Railroad, pfd				1 % Q., Feb., '99.	21 81%	22 82 <sup>3</sup> / <sub>4</sub>	New Orleans & Carrollton RR New Orleans Traction Co new com New Orleans Traction Co new pfd	100		***************************************	4 % S., July, '98. 1½ % Q., Oct., 98.	1485 25 101	153 265 102		
Charleston, S. CFeb19 Charleston City Ry. Co	50 25	100,000		3 % 8.	-	::	aCrescent City RRguar bNew Or. City & Lake RRguar Orleans Railroad	100	2,000,000 2,000,000 500,000	2,000,000 2,000,000 185,000	3 % S., Jan., '99. 4 % S., Jan., '99. 1½ %., June, '94. 1½ %. Oct., '98.	203	52		
(hicago, IllFeb 19	20	1,000,000	200,000	,			St. Charles Street Railway New York-Feb 19		1,				5 57		
chicago City Ry. Co. Obicago & South Side R. T. RR. Lake Street Elevated RR. Metropolitan West Side Elev. Ry. Met West Side El., pfd North Chicago Street RR. North Chicago City RR. South Chicago City Rallway. West Chicago St. RR. Co. Chicago West Diy Ry.	100 100 100 100 100 100	10,823,800 10,000,000 15,000,000 15,000,000 10,000,000 500,000	10,828,800 10,000,000 15,600,000 2,500,000 6,600,000 249,900 1,608,200	8 % Q., Jan., 99	193, 24 76 280	280 20 25 78 231 	Central Grosstown RR	100 100 100 100 100 100 100 100	750,000	748,000	14% % Q.	265 170 125 1773 35 230 195 890 395 195	280 180 150 1773 40 240 405 410		
Chicago West Div. Ryguar	. 100	2,000,000		5 % 8.	::	85	kSixth Avenue RRgual Twenty-third St. R. R. Coguar	r 100	2 000 000		47.80	200	205 211 420		
Cincinnati, OhioFeb 19: Cincinnati Inc. Plane Bycom							Second Avenue RR Third Avenue RR	. 100	2,500,000	1,862,000	4½ % Q. 2% Q., Jan,, '99. \$1.75 p. sh. Feb. 99	200	205		
Cincinnati Inc. Plane Ry	100	1,000,000 150,000 4,000,000 18,000,000	575,000 150,000 8,500,000 14,000,000	% % Feb., '99. 2½ % Feb., '98. 1½ % Q., Jan., '98. 1½ % Q., Jan., '98.	83	89 121	m42d St., Manhatv'le & St. Nich. Av *Union (Hucklaberry) Ry Newark N. J.—Feb 19:	. 100	2,500,000	2,500,000		75 190	82 200		
Cleveland, Ohio Feb 19 Arron, Bed. & Olev. Elec. By Oleveland City By	100	1,000,000	1,000,000	34 % Jan., '98 3-5 % Jan. '99.	48	50 10 t	Consolidated Traction Co. of N. J North Jersey Street Railway Co United Electric Co. of New Jersey Pittsburg, Pa.—Feb 19:	100	504,000	6,000,000 504,000	1154 % A.	613 29 273	80		
Detroit, Mich. Feb 19 Detroit Citizens' Street Ry. Ft. Wayne & Belle Isle Ry. Rapid Rallway Co. Detroit Electric Rallway	100	2,000,000	1,250,000 1,200,000 250,000		1003 175 90	91	Allegheny Fraction Cocom  OConsolidated Traction Copfd pCentral Traction Copfd pCitizens' Traction Co  Tuquesne Traction Co  Pittsburg Traction Co	. 50 . 50 . 50 . 50	15,000,000 15,000,000 1,500,000 8,000,000	15,000,000 15,000,000  900,000  8.000,000	2%, Jan., '95. 3%, Nov. '98. 11% Nov. 7, '98.	54 28 61 69 69	55 283 62 70 70		
Wyandoite & Detroit River Ry  Dayton O.—Feb 19 City Railway Co	100	1,500,000	1,470,600		100 1261 160	iio	Federal St. & Pleasant Valley Ry. Pgh., Allegheny & Man. Trac. Co P'ttsourg & Birmingham Trac. Ry. Pittsburg & West End Ry. United Traction Co	- 25 - 50 - 25 - 50	2,500,000 5 1,400,000 6 8,000,000 6 8,000,000 0 1,500,000 0 17,000,000	1,900,000 1,400,000  2,994,889 8,000,000 1,500,000	06 % A. 083' %, Nov. 7, '98. 02% %, July, '98. 02%, Aug., '95. 1 %, Oct. '98. J. & J. J. & J.	28 40 3. 12	283 423 16		

\*Unlisted. † Ex div.

a The Unlisted Railways & Electric Company comprises in its organization the Baltimore Consol dated Railways & Electric Company comprises in its organization the Baltimore Consol dated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by the se companies, and also the Central Railway Co of Baltimore. The pref \*lock of U R & E ec Co. ha-been issued in the form of income bonds.

b Leased to B ston E evated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co., e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co., f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR. g Owned by Atlantic Ave. RR and leased to Nassau syst. m.

h \$30 per share on outstanding capital pa'd as rental by lessee — West Chicago St. RR. Co., 250 100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Steret Railroad Tunnel Company.

j \$5 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company.

k Majority of stock owned by Chicago West Division Railway Company; 5% on \$1,000,000 stock guaranted by West Chicago Street Railroad, seruming its bo

\*Unlisted. † Full paid. | Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

c Leased to 23d Street Ry for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.

i Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock

Leased to Metropolitan Street Railway for 18 % on capital stock.

Controlled by Third Avenue Railway for 18 % on capital stock.

Dointolled by Third Avenue Railway for 18 % on capital stock.

Ocntrolled by Third Avenue Railway for 18 % on capital stock.

Controlls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 6 % on \$3,000,000 capital stock.

Leased to Consolidated Traction Company for 6 % on apital stock.

Leased to Consolidated Traction Company for 7 % on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

#### Capital Stock. Capital Stock. Bate and Date of Last Div. Par Authors'd Issued. E3d. Asked Par Authors'd Issued. NAME. NAME. New Bedford Mass-Feb 19 Boston, Mass. - Feb 19. 100 50,000,000 28,650,000 4% % Q., Jan., '99. 836 1 % Q., Feb. 20, '99 119 10,894,600 10,804,600 \$1.50 p. sh. Feb '99. 185 165 American Bell Telephone Co..... Erie Telegraph & Telephone Co.... New England Telephone Co.... 100 \$850,000 \$850,000 2 %, Feb. 98. 160 t nion Street Railway Co... 1 (6) ( 186 Northampton, Mass-Feb 19 Northampton Street Rv ..... 170 178 100 800,000 225,000 4 % A., June '98, New York.-Feb 19 Omaha, Neb.- Feb 19; 96 114 1903 99 117 198 50 118 5,000,000 8 % A. and N. 10 5,000,000 55 Umaha Street Ry..... Paterson, N. J.-Feb 19: 190 \ 198 | 50 | 112 | 118 | 118 \ 118 \ 119 | 117 | 8 \ \ 167 | 78 | 82 100 1,250,00 1,250,000 54 Paterson Ry. Co..... Providence, R. I.—Feb 19 United Traction & Electric Co .... 100 8,000,000 100 2,000,000 100 5,000,000 25 2,000,000 100 15,000,000 100 8,000.000 8,000,000 3/2 %, Oct. '98 108 108% 8½ 175 82 8,728,000 2½ % Q., Jan., '99. 15,000,000 1 % Q. 559,525 2½ % S. 500,000 8 % S., Jan., '99. 97,870,000 1½ %, Q. Jan. '99. Philadelphia.-Feb 19. 2,000,000 1,966,100 588,900 800,000 1,770,000 2 %, Dec. '97. [1,966,100 2 % %, July 15, '98. 1588,900 3 % 8—July, '98. 300,000 8 % Feb. 1, '98. 47 75 76 351 116 25 25 950,000 **500,00**0 15 83½ 351/2 80.000,000 Miscellaneous.-Feb 19: 500,000 451 8,561,000 2 % S. 84 1,000,000 1,000,000 A. & O. +771,076 % share A. Mar. 98 16,000,000 8 %, A. April, '98. 1572,800 \$5.25 share—1898. 150,000 8 % Jan., 1898. ;;; 90¾ 65 210 150 76 120 120 120 1,060,000 750,000 2,000,000 1 % Q. 2,500,000 23/4 % Q. 948 961/4 157 ELECTRIO LIGHT AND ELECTRIOAL MFG. 008. 208 Boston, Mass.-Feb 19: BOSLOII, MSSS.-Feb 19: Fort Wayne Electric trust receipts.. Ft. Wayne Electric Co. [T. Sec. Series A. tGeneral Electric Co. [new]...... General Electric Co. [new]...... T.-H. Elec. Co..T. Secur., Series D. Westinghouse Elec. & Mfg. Co. com. Westinghouse El. & Mfg. Co. pfd. Westinghouse El. & Mfg. Co. assent. 809 . . . . . . . . . . . . . 123 40 118 117 240 1281/4 48/4 68 •••• 146,700 50 8,996.058 134 % Q., Jan., '99. 8,195,126 48 61 50 4,000,000 50 11,000,000 Rochester, N. Y .- Feb 19: R chester Railway Co..... New York.-Feb 19; 100 5,000,000 17% 20 5.000.000 7,988,000 2,000,000 1½ % Oct., '98. 120 Reading, Pa.- Feb 19 119 1,000,000 850,000 1,000,000 1,000,000 Semi-an.,Jan. & Jy 850,000 Jan., '98. 11,000,000 Jan., '98. 13 93 8 82 • - - - • • • • 40,000,000 18,276,000 1,000,000 30,460,000 2 % Q., Aug., 1898. 18,276,000 1½ % Q., May '99. 100 St. Louis Mo.-Feb 19 1581 1233 800,000 400,000 2,500,000 2,500,000 2,000,000 2,000,000 2,400,000 150,000 400,000 2 % Dec., 1888. 2,400,000 1½ % Jan., '99. 2,500,000 1,500,000 4 %, Oct., '98. 2,000,000 2½ % Jan., '99. 300,000 50c., Dec., '89. 50 50 100 2,500,000 2,500,000 A. & O. 196 110 Pittsburg, Pa.-Feb 19 Allegheny County Light Co...... East End Electric Light Co...... 100 J. & J. 172 500,000 Philadelphia, Pa.-Feb 19 Edison Electric Light 00...... \*Electric Storage Battery Co...com. \*Electric Storage Battery Co...pfd. Northern Elec. Light & Power Co... Southern Elec. Light & Power Co... 144 120 116 18 2,000,000 8,500,000 1,000,000 1,000,000 2,500 80 773 .... 190 18% 550,000 187,500 187.50 • • • • 4,000,000 8 % A., July, '95. 4.000,000 Miscellaneous.-Feb 19: San Francisco, Cal. - Feb. 49 28 15 160 8 500,000 47 25 10 156 6 195 98 1184 800,000 50c. monthly. 875,000 \$2.50 share, '96. 18,750,000 Q., 60c. per share. 550,000 ...... • • • • 1,000,000 18,750,000 1,000,000 621/ 850,000 175,000 100,000 Scranton Pa -Feb 19 1,200,000 2 % Q., Oct. 180 1,085,000 13% Q 8 % S, Dec. i, 98. 6,000,000 500,000 1,050,000 2,500,000 500,000 1,050,000 80 163 1,000,000 192 187 1 1893 Springfield III.-Feb 19 105 100 Springfield Consolidated By 750,000 tOn Aug. 17 last by a majority vote of the stockholders the capital stock was red to \$20,827,200, of which \$18,276,000 is common and \$2,551,200 preferred. LEX Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent pany, the Municipal Electric Light Co. 100 750,000 Springfield O.- Feb 19 Springfield Street Ry ..... 11 100 1,000,000 1,000,000 Springfield, Mass.-Feb 19. ALLIED INDUSTRIES. Springfield Street Ry..... 207 100 1,200,000 1,166,700 8 % A. 212 Toronto Canada.-Feb 19. Boston Mass.-Feb 19: ₹ 102¾ 294 BOBOII MESS.—Fee 13. Delaware Gas Light Co.......com. Delaware Gas Light Co......pref. American Electric Heating Co...... Street Ry. & Illu'g Properties...pfd United Electric Securities Co...pfd. Toronto Street Ry...... Montreal Street Railway Co..... 6,000,000 134 % B. 4,000,000 4 % B. 500.000 72× 98 4,000,000 10,000,000 **4,5**00,000 Washington, D. C.—Feb 19: 1,248,700 \$2 p. sh. Jan. 26, '99 1,000,000 \$8.50 p.sh. Nov '98. 50 500,000 112,000,000 50 400,000 50 707,000 50 200,000 50 1,000,000 500,000 12,000,000 400,000 652,000 200,000 458,900 2½ % Q. 100 92 9216 New York.-Feb 19: Oonsolidated Electric Storage Co... Safety Car Heating & Lighting Co... Worthington Pump Co.....com. Worthington Pump Co.....pfd 12 155 • • • • • • 8 150 100 5,500,000 2,000,000 5,500,000 2,000,000 100 100 100 110 Worcester, Mass.-Feb 19 8,000,000 2,000,000 550,000 8,000,000 2,000,000 542,500 4½ %, 1897. 81 106 85 100 28 105 Philadelphia Pa.-Feb 19: \*Worcester Traction Co.......6 % pfd. Worcester & Suburban Street Ry... 1,500,000 10,000,000 8,500,000 500,000 525,100 500,000 11¾ 57¾ 42 Wilkesbarre, Pa.-Feb 19: 2 % Q Wilkesbarre & Wyoming Val. Trac.. 100 5,000,000 5,000,000 1%, Jan., '97. \*\*Wilkesbarre & Wyoming Val. Trac... | 100 | 5,000,000 | 5,000,000 | 1%, Jan., '97. | 25 | 29 \*\* Unlisted. † Paid in. ‡ Full paid. ‡ Outstanding. ‡ Ex-div. a Leased to Hestonville, Man & Fairmount Passenger Ry, for 6 % on stock per annum. 5 Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company. c Practically all shares owned by Union Traction Company. d Lease to Frank ford & Southwark Passenger Ry, assumed by Electric Traction Co. c Leased to Electric Traction Company. f Controlled by Frank ford & Southwark Passenger Railway. g Leased to Deople's Passenger Railway at \$5 per share. h Majority of stock owned by People's Traction Company. f Leased to Union Traction Company. f Leased to Union Traction Company. f Leased to United Traction Company at a rental of \$10,000 per annum in 1866-7-8 p.a. \$20,000 in 1899-1900 and \$30 0 per annum thereafter, payable semi-annually, rental, declared as a dividend semi-annually. E Dividend of 10 % guaranteed by Reading Traction Company. Dividend of 6 % guaranteed by Reading Traction Company. Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co. 156 Pittsburg, Pa.—Feb 19: Oarborundum Mfg. Oo...... Standard Underground Oable Co... 200 000 200.00 ë 175 1,000,000 180 Miscellaneous.-Feb 19: 21 98 25 100 îx 1.250,000 1% % Feb. '98 58 95 4 47 1.250,000 ..... 96 56 2 % Sept 1,'98 500,000 \*Unlisted.

# BONDS.

PASSENG	ER R	MILWA	7 .				PASSEN	GER R	AILW	47.			
	Amou	mt.		Interest				Amo	unt.		Interest		
NAME.	Authorized.	Issued.	Due	periods.	Bid.	Asked.	NAME.	Authorized.	Issued.	Due	periods.	Bid.	Antre
Albany N. Y.  Date of Quotation— Feb 19, 1900.  The Albany Ry. CoCons. mtg. 5s. The Albany Ry. CoGen. mtg. 5s. Watervieit Turnpike & RR. 1si mtg. 6s. Watervieit Turnpike & BR. 2d mtg. 6s. Toy City Railway Co	8500,000 750,000 850,000 150,000	850,000 150,000	1947 1919		*117 % *116 % *126 *128 *116 4	127½ 127	New Orleans La.  Date of Quotation—Feb 19, 1900.  Canal & Claiborne RR cons mig. 8s. Crescent City RR	\$150,000 5,000,000 416,500 5,000,000 850,000 800,000 800,000	50,000 8,000,000 899,000 2,599,500 850,000 800,000	1899 1948 1908 1948 1907 1912	M. & N. M. & N. J. & J. J. & D. J. & J. F. & A. J. & J. J. & D.	105½ 108 112	112 118
Baltimore Md.  Date of Quotation—Feb 19, 1600  Inited Electric Ry. Co1st mtg. g. 4s.  "	88,000,000 14,000,000 2,000,000 1,500,000 1,250,000 750,000 800,000 96,000 8,000,000 1,000,000	2,000,000 1,500,000 1,250,000 1,750,000  117,000 580,000 8,000,000	1949 1911 1929 1901 1942 1900 1906 1912 1932 1922	J. & D. M. & N. M. & N. M. & S. J. & D. J. & J. N. & M. J. & J. M. & N. J. & D.	102 7434 11878 119 10442 121 101 10224  119 116 117	102½ 75 120  121½  121 117	New York.  Date of Quotation—Feb 19, 1900.  Atlantic Ave. (Brooklyn)Imp. g. 5s. Atlantic Av. (Brooklyn)lsigen. mig.5s. tAtlantic Av. (Brooklyn)Cons. mig. 5s. tBro'dway & 7th Avest cons. mig. 5s. Broadway & 7th Avelst mig. 5s. Broadway & 7th Avelst mig. 5s. Broadway Surfacelst mig. 5s. Broadway Surfacelst mig. 5s. Brooklyn City RR. Colst cons. mig. 5s. Brooklyn City & Newtownlst mig. 5s. Brooklyn Bath & W.E. RR.Gen. mig. 5s. Brooklyn Heighis RRlst mig. 5s. Brooklyn, Qis Co. & Sub'nlst mig 5s. Brooklyn, Qis Co. & Sub'nlst mig 5s.	1,500,000 759,000 8,000,000 12,500,000 1,500,000 1,125,000 1,000,000 2,000,000 2,000,000 2,500,000 3,500,000 4,500,000	1,966,000 7,650,000 1,500,000 500,000	1909 1981 1948 1904 1914 1924 1905 1941 1989 1988 1941 1941	M. & S. A. & O. J. & D. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J.	95 1073/ 115 128 104 108 115 105 116 115 101 104 112 107	110 110 122 100 110 111 100 113 110
## All of the bonds of the above ompanies, marked †, have been assumed by the United Railways & Electic Company.  BOSTON, MASS.  Date of Quotation—Feb 19, 1900.  Lynn & Boston RBlst mig. g. bs. Test End Street RyDeben. g. 5s. fest End Street RyDeben. g. 4%s. figl. 574,000 in escrow to retire outstanding bonds of absorbed companies.  Charleston S. C.  Date of Quotation—Feb 19, 1900	5,879,000 8,000,000 2,000,000	2,000,000	1902	M. & S.	114 104% 112	115 106	Brooklyn, Q's Co, & Sub'n. 1st cons. 5s. Brooklyn Rapld Transit	7,00.000 1,200,000 250,000 800,000 1,000,000 100,000 100,000 1,500,000 1,500,000 1,500,000 1,600,000 1,600,000 1,600,000 1,600,000 1,500,000 300,000	5,181,000 700,000 1,200,000 250,000 800,000 1,100,000 1,200,000 1,500,000 5,000,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000	1945 1900 1902 1922 1908 1982 1914 1914 1915 1998 1997 1909 1922 1919	J. & D. M. & N. J. & J. J. & D. F. & A. F. & A. M. & S. J. & J. M. & S. J. & J. M. & S. J. & J.	109% 101% 107 125 101 117 102 108 116% 89 124 120 120 118% 116 110%	10 10 10 10 11 11 12 10 11 11 11
Interprise Street RR	500,000 850,000	47,000	1906	J. & J. J. & J	106		Third Avenue RR	150,000 2,000,000	5,000,000 150,000 2,000,000	1909 1906	J. & J. J. & J. J. & J.	106 118	10
Chicago III.  Date of Quotation—Feb 19, 1900.  Ohicago City Ry	1,500,000 4,040,000 7,574,000 15,000,000 8,171,000 500,000 2,500,000 4,100,000 2,700,000 12,500,000	600,000 7,500,000 750,000 4,040,000 8,781,200 15,000,000 500,000 500,000 2,500,000 8,969,000	1908 1929 1929 1907 1982 1928 1942 1906 1911 1900 1927 1928 1911	F. & A. J. & D. A. & O. J. & J. J. & J. J. & J. J. & J. J. & J. M. & N. J. & N. J. & D.	101 <sup>3</sup> / <sub>4</sub> 108 <sup>1</sup> / <sub>6</sub> 96 106 108	109 96% 1111 102 107	It Westchester Electric RRlst mtg. 5s.  †\$1,085,000 in escrow to retire gen. mtg. bonds.  1\$4,850,000 in escrow to retire maturing obligations.  †\$552,000 in escrow to retire lst and 2d mtg. bonds.  2In treasury, \$80,000.  It Guar. by Union Ry. Co.  TOPONIO CANAGA.  Date of Quotation—Feb 19, 1500.  Montreal St. Ry	2,500,000 4,550,000		1908	J. & J.  M. & S.  M. & S.		
irended debt assumed by Ohicago W.  iv. Ry. Co., controlling interest of hich is owned by W. Ohicago St. RR.  o., lessee. Bubject to call after Oct. 1, 1899, at 10 and interest. Assumed by W. Ohicago St. RR. Co.  Cincinnati, O.  Date of Quotation—Feb 19, 1900.  in. New. & Cov. St. Ry. 1st Con. mtg. g. 58 ft. Adams & Eden P'k In 1st mtg. 68 ft. Adams & Eden P'k In 1st mtg. 68 ft. Adams & Eden P'k In 1st mtg. 68. ft. Adams & Eden P'k In 1st mtg. 68. ft. Adams & Eden P'k In 1st mtg. 68. ft. Adams & Eden P'k In 1st mtg. 68. ft. Adams & Eden P'k In 1st mtg. 68. ft. Adams & Eden P'k In 1st mtg. 68. ft. Adams & Eden P'k In 1st mtg. 68. ft. Assumed by the Oinein. St. Ry. Co. 18250,000 reserved to retire 1st mtg. bds. † Assumed by the Oinein. St. Ry. Co.	8,000,000 46,000 100,000	100,000 581,000 250,000	1900 1905 1906 1912	J. & J. A. & O. A. & O. M. & S. M. & S. J. & J.	118 % 108 % 1 4 108 % 121 % 182 % 182 % 1	114½ 104  122½ 187	Continental Pass. By	800,000 100,000 150,000 250,000 1,125,000 5,698,210 200,000 1,800,000 29,785,000 250,000 27,785,000 750,000	810,000 200,000 100,000 250,000 488,000 867,000 1,018,000 500,000 29,724,876 246,000 780,000	1898 1901 1905 1911 1912 1948 1910 1917 1908 1911 1945 1906	J. & J. J. & J. M. & S. J. & . F. & . A. & O. A. & O.		
Cleveland, O.  Date of Quotation—Feb 19, 1900.  Brooklyn Street RR. Co1st mtg. 6s. in. New't & Cov. St. Ry. Cons. mtg. 5s. leveland City Cable Ry1st, mtg. 5s. Jeveland Electric Ry. Co. 1st mtg. g. 5s. solumbus (O.) Cent. Ry1st mtg. g. 5s. Sast Cleveland RR	2,000,000 8,500,000 1,500,000 1,000,000 600,000 200,000	2,500,000 2,000,000 1,249,000 1,500,000 1,000,000	1922 1909 1918 1918 1910 1922 1915	J. & J. M. & S. M. & N.	1061/ <sub>6</sub> 1131/ <sub>6</sub> 1051/ <sub>6</sub> 106	107 114 5 106 107 	Pittsburg, Pa.  Date of Quotation—Feb 19, 1900, Birmingham, Knox & Allentown	500,000 875,000 1,250,000 1,500,000 50,000 1,250,000 750,000 750,000 1,500,000 1,500,000 1,500,000 500,000 500,000	500,060 875,000 1,250,000 1,500,000 50,000 1,250,000 250,000 250,000 1,500,000 1,400,000 2,000,000 500,000	1980 1927 1980 1918 1942	J. & J. J. & J. J. & J. M. & N. J. & J. A. & O. M. & N. J. & J. A. & O. J. & J.	108%	108
Date of Quotation—Feb 19, 1900. Detroit Citisens' St. Rylst mtg. 5s. t. Wayne & Belle Isle Rylst mtg. 6s. he Detroit Ry	400,000 1,800,000	8,885,000 877,000 1,800,000	1902	A. & O.	105	102½ 106½	Providence R. I.  Date of Quotation—Feb 19, 1100.  Newport Street Ry	50,000 9,000,000		1910	J. & D.	116	ï
New Haven Conn.  'Date of Quotation— Feb 19, 1400, New Haven St. Ry	600,000 250,000 100,000 100,000	600,000 250,000 500,000 24,000	1914 1912	J & D	111 111 109		Date of Quotation—Feb 19, 1500 Baden & St. Louis RR1st mtg. 5s. Case Ave. & Fair Gds Ry1st mtg. 5s. Citizens' Railway Co1st mtg. 5s. Comp. Hts. Un. De. & Mer. Tere.1st	5000,000 1,600,000 2,000,000 1 000 000	250,000 1,600,000 1,500,000 000 000	1912 1907	J & J	100 102 109 117	16 10 10 11

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PASSE	GER F	RAILW	AY			
•	Ame			Interest		
PARE.	Authorized.	Issued.	Due	periods.	Bid.	Asked
St. Louis.						
Date of Quotation—Feb 19, 1900  Jefferson Avenue Bylst mtg. 5s.	400,000	400,000	1908	M. & N.	1(3	105
Lindell Ry. Colst mtg. 5s Missouri RB. Co	1,500,000 1,000,000	1,500.000 700,000	1911	F. & A. M. & S.	108 105	106
Mound City RR. Co1st mig. 68.	400,000 125,000	800,000 125,000	1910	A. & O. J. & D.	100	102
People's RR. Colst mtg. 6s.  People's RR. Co2d mtg. 7s.	75,000	75.000 800,300		M. & N.		
People's RR, CoCons. mtg. 6s. St. Louis & E. St. L. Electricist mtg. 6s.	1,000,000 75,000	75,000	1905	J. & J.	100	101 100 ×
5t. Louis BR. Colst mtg. 5s. 18t. Louis & Sub. Bylst mtg. g. 5s.	2,000,000 2,000,000	2,000,000 1,400,000		M. & N. F. & A.	103	104
St. Louis & Sub. ByIncome 5s.    Southern Electric ByCons. mtg. 6s.	800,000 500,000	800,000 500,000	1909		80 106	108
Taylor Avenue St. Bylst mtg. g. 6s. Union Depot BB. Colst cons. mtg. 6s.	500,000 1,091,000			A. & O.	116	118 1005
Union Depot BB. CoCons. mtg. 6s. †Controlled by St. Louis BB. Co.	8,500,000	1,787,000	1918	J. & J.	121	122
Controlled by Union Depot BB. Co.	ļ	1				}
\$200,000 in escrow to retire 1st & 2d						
ntg.   \$\$500,000 in escrow.       \$200,000 in escrow to retire lst mtg.	•	İ	l			
ode						
San Francisco Cal.  Date of Quotation—Feb., 1900.						ĺ
Salifornia St. Cable BRIst mtg. g. 5s.	1,000,000 650,000	900,000 650,000	1915 1914		114	117 117
Ferries & Cliff House Bylst mtg. 6s. leary St., Park & Ocean BBlst. mtg. 5s.	1,000,000 8,000,000	671,000	1921 1918	A. & O.	1263	95
larket St. Cable By. Colst mtg. g. 6s. Metropolitan By. Colst mtg.	200,000		1918		128%	
Omnibus Cable Colst mtg. 6s. Park & Cliff House BBlst mtg. 6s.	2,000,000 850,000	850,000	1912	J. & J.	105 1/4	107
Park & Ocean BBlst mtg. 6s. Powell St. Bylst mtg. 6s.	250,000 700,000	700,000	1914 1912	M. & S.	115	125
utter St. Ry. Co1st mig. g. 5s. †Controlled by Market St. Ry. Co.	1,000,000	900,000	1918	M. & N.		•••••
Washington D.C.						
Date of Quotation—Feb 19, 1900 selt By. Co	500,000	450,000	1920	J. & J.		
olumbia By mtg. 6s. ckington & Soldiers' Hom., mtg. 6s.	500,000 200,000	500,000 200,000	1914 1911	J. & J. A. & O. J. & D.	182	•••••
Setropolitan RR. CoColl tr. cons. 6s.	500,000		1901	J. & J.		•••••
†\$50,000 in escrow to retire 1st mtg.bds. Miscellaneous.						
Date of Quotation-Feb 19, 1900.						
ridgeport Traction Colst mtg. 5s. uffalo (N. Y.) By. CoCons. mtg. 5s.	2,000,000 5,000,000	1,683,000 8,548,000		J. & J. F. & A.	108 118	110
'tisens' St. R. (Ind'polis).lst cons.m.5s Prosstown St. Ry. (Buffalo)lst. mtg.5s.	4,000,000 8,000,000	8,000,000 2,366,000		M. & N. M. & N.	104 112	105 118
Columbus (O.) St. Rylst cons. g. 5s. onsolidated Traction (N. J.)lst mtg.5s	8.000.000	2,261,000 18,965,000	1932	J. & J. J. & D.	115 111¼	1113/6
Prosst'n St. Ry. (Colu's, O.)lst mtg.g.5s enver City Cable Rylst mtg. g. 6s.	2,000,000 4,000,000	572,000 8,800,000	1938	J. & D.	115	115
enver Con. Tram'y CoCon. m. g. 5s.	4,000,000	922,000	1933	J. & J. A. & O.	20 80	85
ouisville (Ky.) Ry1st cons. mtg. g.5s. Minneapolis St. Ry1st cons. mtg. g. 5s	6,000,000 5,000,000	4,981,000 4,050,000	1919	J. & J. J. & J.	119 1101/4	119% 110%
No. Hudson Co.Ry.(N.J.).Cons.mtg. 5s. o. Hudson Co.Ry.(N.J.)2d mtg. 5s.	8,000,000 550,000	2,378,000 550,000	1928	MAN.	108	•••••
o, Hudson Oo, Ry. (N. J.)Deb. 68. aterson (N. J.) ByOons. mtg. g. 68.	500,000 1,250,000	1,000,000	1931	F. & A. J. & D.	••••	•••••
ochester (N. Y.) Bylst mtg. 5s. t. Paul City RyOous. g. 5s.	8,000,000 5,500,000	2,000,000 4,298,000		A. & O.	105%	106
. Paul Oity RyDeb. g. 6s.	1,000,000	1,000,000	1900		103	••••
†\$1,000,000 in escrow to retire 1st and i mtg. bds.			i		]	
1\$800,000 in treasury. Bonds guar. by suffalo By. Co.						
\$8760,000 in escrow to retire bands of .C. St. BR. Co.						
1887,000 in treasury. 18960,000 resived to federa prior lians.						
+\$620,000 in escrow.					*****	
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Boston, Mass						
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dison files. Illuminating Oo., Boston	2,026,000			Guar.	157 116	
eneral Electric Cogold coup, deb. 5a Pittsburg Pa	10,000,000	8,750,000	1922	********	*10	•
Date of Quotation—Feb 19, 1900					110	
llegheny County Light Co 68. Vestinghouse Elec. & Mfg. CoScrip 68.	500,000 195,570		1911	J. & J. M. & S.	110	•••••
Miscellaneous.—(Feb 19, 1900.)						
dison El. Ilig. Co. (N. York) lst m. 5s dison El. Ilig. Co. (N. Y.) con. m. g. 5s.	4,812,000 15,000,000		1910 1993		109 124	•••••
dison Elec. Ilig. Uo. (Brooklyn)	5,000,000 2,000,000		1940		1221/4	124
dison Electric Light (Philadelphia) lings Co. El. Lt. & Pow. Co.lst mtg. 5s.	2,500,000		1937		100	10:
ings Co. El. Lt. & Po. Co. pur. money 6s ilwaukee El. Ry & Lt. Co. lst con g. 5s	5,176,00 8,000.000	5,176,000 6,108,000		A & O. F. & A.	120 102½	
nited Elec. Light & Power Oo(N. Y.)	5,000,000	 FELEC	\ <u>\</u>		• • • •	•…
TELEPHONE	AND T	TELEG	1	1	<del></del> -	
Miscellane us.  Date of Quotation - Feb 19 , 1100.	İ				1001/2	101
merican Bell Telephone75. Northwestern Telegraph Co76.			1908	F. & A.	•••••	• • • •
I.Y. • N.J. Telep & Tely Co. gen.mtg.5s			1911	J.A.D.	1'4	15 166
chesapeake & Potomac Teleph. Co5s.	18/7//5			., . <del></del>		
Macellaneus	INDUS	RIE	<del>ح</del> .	1		
Miscellaneous.  Oats of Quitation—Feb 19, 1100.						
merican Electric Heating7s.	<b>600,00</b> 0	<b>5</b> 00 0 x0				25
armington & Sims Engine Co			1942 1904		106	107
arborundum Mfg Coes. orthington Pump Coes.	75,000			1	<b></b>	•••••
WUnlisted Nomina						

# NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 152@16c.; Lake, 16@16½c.; casting,  $15\underline{1}\underline{6}\underline{1}5\underline{7}c$ .

The Cauadian General Electric Company will issue \$300,000 additional common stock.

Senator Chris L. Magee of Pittsburg has resumed negotiations for the consolidation of every street railroad in Allegheny County, Pa.

The Buffalo (N. Y.) Traction Company reports for the quarter ended December 31 gross earnings of \$21,796, an increase of \$2,966, and net \$5,625, an increase of \$7.115.

At the annual meeting of the Hartford (Conn.) Electric Light Company the stockholders voted to increase the capital stock by 50 per cent., from \$700,000 to \$1,050,000.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Bat, 16 2019; New York Electric Vehicle Transportation, 81/29; New England Transportation, 6(264).

The Metropolitan West Side Elevated Railroad Company, of Chicago, has declared a dividend of 2½ per cent. on its preferred stock for the year 1899, payable February 28. This is the first stock dividend the company has declared.

The Michigan (Bell) Telephone Company, which recently absorbed various independent companies in Michigan, voted unanimously to increase its capital stock from \$2,500,000 to \$10,000,000. More than two-thirds of the stock was represented

At a meeting of the stockholders of the United Traction Company of Albany, N. Y., it was unanimously decided to increase the capital stock of the company from \$4,000,000 to \$5,000,000. Ten thousand shares at a par value of \$100 will be issued. \$3,000,000 worth of stock was represented at the meeting.

The Canadian General Electric Company has issued a circular, in which it states that a new issue of common stock to the amount of \$300,000 will be issued. The price of the issue will be decided upon at the annual meeting. The additional stock will make the total capital of \$1,200,000 in common and \$300,000 in preferred.

New York brokers are looking after proxies on the stock of the Electric Light & Power Company of Dolgeville, N. Y., for a vote to foreclose the mortgage held by the Trust Company. In their letters they say rents of lights at Dolgeville are too low and at Little Falls too high and that a mutual understanding between the two companies would be valuable to both.

The stockholders of the United Railways & Electric Company of Baltimore at their annual meeting re-elected the retiring board of directors. A statement given out by the company for the nine months ended Dec. 31, 1899, shows: Gross earnings \$3,402,200; operating expenses, including insurance, taxes, interest, \$3,359,863; net earnings \$42,337. The directors re-elected the present officers.

August Belmont's company, which will gurantee Mr. McDonald's Rapid Transit contract and make a profit out of the equipment and lease of the Rapid Transit Railroad, was incorporated Monday. It is called the Rapid Transit Subway Construction Company, of New York City, and has a capital of \$6.000,000. Cornelius Vanderbilt is one of the directors. The bond, it is said, will be filed on Saturday.

The strength in General Electric recently is attributed to buying for inside interests on the prospects of a tavorable showing which will be made in the annual statment. The fiscal year ended January 31 and although it will take some weeks to secure final figures it is reported the volume of business will be much greater than expected. It is stated that something over \$26,000,000 of business was probably transacted.

Directors of the Chicago Telephone Company have decided to issue within the present year \$1,000,000 of \$10,000,000 new stock recently authorized. That is the amount of money to be expended in 1900 in improvements and extending the company's plant. The stock will be offered to present holders at par in the ratio of one new share for every five now held. One half of the new stock is to be paid for by April 5, and the other half by October 5.

The Philadelphia Electric Company, in accordance with the consolidation agreement, has completed the purchase in the open market of \$2,000,000 Philadelphia Electric gold 5s. The purchase was made quietly, and with a view of preventing an advance in the price while the operation was in progress. The amount now outstanding is said to be \$11.200,000. The purchase of these bonds makes an annual saving in interest charges of \$100,000. It is understood that no more of the bonds will be retired.

Alexander Brown, of the banking house of Brown Brothers, of Baltimore, admits that a deal is pending looking to a consolidation of all the street railways of Pittsburg, and that it would probably be consummated. He said, however, that he was not yet at liberty to discuss the details of it. The properties involved are those of the United Traction Company, in which Baltimore men are largely interested, the Consolidated Traction Company and the Mellon system. These companies operate a total of more than two hundred and forty-six miles of track in Pittsburg, Allegheny City and adjacent towns. Mr. Brown represents the United Traction interests in the negotiations.

Consolidation of practically all the case and electrical business of New York City

Consolidation of practically all the gas and electrical business of New York City has been announced officially. The president of the Consolidated Gas Company, which is controlled by the the Rockefeller-Stillman party, in an address to shareholders said that the company had bought every electric light, heat and power company in operation or having a franchise in Manhattan and Bronx boroughs and in Yonkers. The price paid was \$36,000,000 and a debt of equal amount was assumed, making the price paid for the New York Gasand Electric Light, Heat and Power Company's properties equal to \$72,000,000. Besides this, the Consolidated Company has acquired four other companies. Their cost, together with the price paid for the nower company's securities, makes the total outlay for the business of Manhattan, Bronx and Yonkers about \$89,000,000. This purchase, therefore, gives to the Rockefeller Stillman party a practical monopoly of the gas and electric light, heat and power business in the territory named.

Third Avenne Railroad (New York) stock is awinging around in staggering ways

Third Avenue Railroad (New York) stock is swinging around in staggering ways in Wall street and is now below par. How the creditors of the road are to be satisfied now that the syndicate of bankers headed by Kuhn, Loeb & Co. have refused to finance the \$17,000,000 floating debt, is a question which is harassing the directors. But it is causing more uneasiness among those to whom the road owes money. The bankers became disgusted with the dilatory tactics of the Third Avenue officials in coming to terms. They became convinced that the directors were using the negotiations for stock-jobbing purposes. Third Avenue stock would fluctuate in harmony with the supposed progress of the refunding scheme. Wall street was led to believe that the matter was practically settled. Therefore the announcement of the syndicate's withdrawal caused great surprise and some dismay. The financial writer of the New York "Times," referring to the above trouble, says: "A corporation keeping its affairs in secret, and in the face of such conditions disbursing dividends to shareholders (who thus might be persuaded that prosperity was attested), is a corporation—not well managed.





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# **FLECTRICITY**

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# EDITORIAL NOTES.

"Why Not Investigate?"

During the meeting of the League of American Municipalities, held at Syracuse, N. Y., last

September, a proposition was made to the League by the National Electric Light Association to make a thorough investigation of the question of municipal ownership of quasipublic corporations, and offered to pay one-half the expense (the total expense not to exceed \$5,000) for the employment of a competent expert to examine as many municipal electric light plants as the above sum would permit. the properties to be examined to be selected by the League of American Municipalities, and said expert to be selected by the president of the National Electric Light Association and approved by the president of the League, the result of such examination to be in the form of a report, sworn to before a notary, in duplicate, one copy of which was to be furnished to the League and one to the National Electric Light Association.

The League of American Municipalities accepted the offer on the following conditions:

"First—That the president of this League appoint one investigator, and the president of the National Electric Light Association another, these two with any needed assistants, to investigate jointly and report on all points of agreement and disagreement.

"Second—That the investigation extend to the charges for domestic, commercial and street lighting, the cost of coal, the wages and hours of labor in private companies whose conditions are as similar as may be to those of the public plants examined. The presidents of the two Associations, in conference with their expert investigators, to select the plants to be examined, both public and private. In case of disagreement on this point, half of the public and half of the private plants to be selected by each president.

"Third—That in view of the regular dues of the Association being inadequate for even ordinary running expenses, the money for this investigation shall be secured by our treasurer from special donations, and our acceptance of the offer under consideration shall be conditional on the raising of this money, for which end we hereby request all those interested to contribute liberally."

The officers of the National Electric Light

Association acquiesced to all the stipulations made by the League and even offered to pay the entire amount required for the investigation, but up to this time no steps seem to have been taken by the League to push the matter to a conclusion, and we were not surprised to find the following editorial, under the caption "Why Not Investigate?" in the last issue of "City Government":

"The National Electric Light Association will meet at Chicago on May 22, 23 and 24. In the meanwhile it behooves the League of American Municipalities to take some action upon the challenge of the Electric Light organization to join with it in an expert examination of the results of municipal ownership of lighting plants. This challenge was offered at the Syracuse convention of the League, where it was accepted with the understanding that the proposed investigation should be carried on by two experts.

"So far as our observation reaches the League has made no effort to raise the funds for the investigation, while the Electric Light Association has not only secured its half of the money, but stands ready to furnish the entire \$5,000. In other words, the electric light people are prepared to contribute to the League its share of the expense of the proposed investigation.

"Considering that the Electric Light Association is composed of parties having large financial interests involved in the question proposed for investigation, and that the results of any such investigation would be of great value to these parties, it seems entirely proper that they should bear the expense, which they are willing to do.

"The League can in no way prejudice its case by accepting an offer from the Electric Light Association to furnish all of the funds necessary for the investigation, in case such an offer is made unaccompanied by any embarrassing conditions. It matters not where the money comes from so long as the League is left free to appoint one of the two investigators and exercise an equal and unprejudiced hand with the Electric Light Association in the conduct of the investigation.

"Many of the mayors and other city officials who were present at the Syracuse meeting of the League when the proposition of the Electric Light Association was submitted, regarded it as a 'bluff.' Now after the lapse of five months, we find the electric light people still talking and the League silent. The officials

of the Electric Light Association publicly announce their willingness to have the investigation go on at their expense. If this is a 'bluff,' it should be promptly called.

\* \* \*

# The "Panheliomotor."

From time to time mention has been made in these columns of various at-

tempts to utilize the heat of the sun, in lieu of coal or other fuel, for power purposes Such men as Herschel, Ericsson, Nikola Tesla, and others of less note, have tried their hand at it, but as nothing tangible has come of it, it is to be presumed the devices thought of proved too complicated for practical purposes. In a recent issue of the New York "Herald" there appeared a description of an apparatus for utilizing the heat of the sun, invented by a resident of Washington by the name of Dr. William Calver. In an interview, with a representative of the paper already mentioned, Dr. Calver said:

"I believe, in fact, I know, that I have solved the problem of the direct conversion of the sun's rays into a heat which can be utilized on a far cheaper commercial basis than coal. I feel that beyond a doubt I have settled forever the question of the actual commercial harnessing of the direct rays of the sun and of their adaptation to the needs of man.

"There is no limit to the intensity of the heat which I can generate. With the concentrated rays of the sun collected against a mountain side I could melt the rocks and cause the earth to burn like a living volcano. I can produce in one spot a heat vaster and more fierce than that on the face of the sun itself, and a greater heat than any now attainable through the combustion of known substances or through the agency of the electric arc, which now furnishes the fiercest heat known to man,"

The apparatus by means of which the inventor claims to be able to produce a heat exceeding that of the electric arc consists of a movable framework of small flat mirrors, so arranged that one or all can be made to focus the rays of the sun on a given point. This collection of mirrors he calls a "panheliomotor," and refers to it as follows:

"Each of the small flat mirrors is attached to a simple gearing device by which it can be moved at pleasure. Each or all of these little surfaces can be concentrated on a very small surface at any desired distance. In practice they are concentrated on a reservoir."

Commenting on the value of the frame of mirrors as a heating agent Dr. Calver said:

"Now, as to the exact value of the frame before us. I have estimated that each mirror, four by six inches, reflects a heat equal in the course of a year to that generated by the combustion of a hundred pounds of the best anthracite coal. Therefore the frame before us is about equal each year, in heat giving power, to forty tons of the best coal. This is more than the actual cost at which the frame could be constructed. It must be remembered that this frame is only an experimental one, having a reflecting surface of only about one hundred and thirty feet. Upon this model, structures immensely broader and taller can be fashioned."

If we are not mistaken an arrangement somewhat similar to that just described was given a trial in France almost twenty years ago by one Abel Pifre. The device brought out by the Frenchman consisted of a horn-like disk

which threw the sun's rays into a mirror that concentrated and projected them beneath a boiler. The device was never given a practical trial but once and was thereafter abandoned.

That the heat from the sun will some day be made use of for generating steam there is little doubt, but it will not be until some satisfactory system for storing surplus heat has been brought out, similar in principle to the Halpin storage system made use of in connection with garbage destructor plants in England.

\*

Another
Football for
Wall Street.

After the "workers" in Wall Street had thoroughly squeezed the many small investors in Brooklyn

Rapid Transit stock, they turned their attention to the stock of the Third Avenue Railroad Company of New York with a result that the stock declined 10 points on Saturday, closing at 75\(\frac{1}{8}\). This makes a total shrinkage of 150\(\frac{1}{8}\) points in six months, the shares having been quoted at 226 in the early fall. This represents a loss on the \(\frac{1}{8}16,000,000\) of stock at par outstanding of over \(\frac{1}{8}23,000.000\).

It is said that James R. Keene, one of Wall Street's most prominent operators, has become involved in the company's securities. He is, in effect, the real owner of a large part of the holdings of Henry Hart, who formerly owned one-third of the company's capital of \$16,000,-000. The financial tangles of the Third Avenue Company are many and varied. It is said that a number of the large banks hold the road's paper. Several of the largest institutions of this class, as well as half a dozen prominent trust companies, put up most of the money the company is now unable to pay. Officials of none of these will admit this, as it would reflect no credit on their houses for it to be known that they made such injudicious loans. But their names are likely to be revealed when the new directors are selected.

A plan of financing the company and of leasing the properties to a new corporation was under discussion on Saturday at the office of Vermilye & Co., and this firm, with Heidelbach, Ickelheimer & Co., Halgarten & Co., and other smaller Wall Street houses, compose the syndicate which is the last hope of the Third Avenue Company in the matter of monetary rehabilitation. There were present members of the firms interested, Attorney Edward Lauterbach, representing the Third Avenue Company, and Gen. Louis Fitzgerald of the Protective Committee, looking out for the interests of the \$16,000,000 creditors. None of these gentlemen would say anything after the conference, except that the entire ground was gone over and the preliminaries of a plan formulated.

Justice to the stockholders requires that a thorough reorganization of the road should take place at once, and that an investigation should be made in order that the stock-jobbers who have been playing with the road's affairs receive the censure or punishment they justly deserve, "even if they are the parties who have been trying to get a monopoly of the heat, light and power business of New York."

The contract for building the rapid transit railroad in New York was signed on Saturday and Contractor McDonald says that within thirty days he will begin the work of digging and blasting. The work will involve the spending of \$20,000,000 for skilled and unskilled labor, and the employment of over 10,000 men.

William B. Parsons, civil engineer, will superintend the construction of the road. It is the general belief that the Metropolitan Street Railway Company will operate the rapid transit railroad under the contractor's fifty-year lease. Albert B. Boardman, of counsel for the Rapid Transit Commission, said on this point Saturday: "I think I am violating no confidence, when I say that the Metropolitan Street Railway Company is the natural operating company for this road. It occupies the best position to operate and get the best results out of the tunnel. The Metropolitan's lateral lines make the tunnel more valuable to it than to any other company. A law of gravitation will make this lease fall into the hands of the persons most fitted to use it—the Metropolitan Street Railway Company.

# UNDER THE SEARCHLIGHT.

## Notes and Comments on Various Topics.

New Jersey is trying to pass a law substituting execution by electricity, as in New York, for hanging.

In the New Orleans carnival there were sixteen floats operated entirely by electricity. It was the boldest innovation ever attempted at the carnivals in that city, and fully demonstrated the utility of electricity for moving spectacular productions on a grand scale.

The National Cycle and Automobile Company which has recently commenced the manufacture of bicycles, automobiles, etc., in the city of Hamilton, Ont., intends operating its works by electricity supplied by the Cataract Power Company.

A PRESS dispatch from Springfield, O., says: "The National Magneto Electric Telegraph Company, of which Dr. L. E. Niles of Springfield is president, has been offered \$800,000 by an Eastern syndicate for its patents, which cover a new style of telegraphing, by which batteries are dispensed with altogether and magnets substituted.

ASSEMBLYMAN DELANEY has introduced a bill in the House at Albany to permit every city of the State of New York to acquire municipal control of public utilities. It is said to be drawn in a more effective manner than any piece of legislation as yet introduced. The bill is brief and as a whole merely arranges for referendum on the subject of municipal ownership when one-fifth of the voters of any city demand that ballots for this purpose be prepared.

THE plans for the first Automobile Show, which will be managed by Mr. Marcus Nathan, have now taken definite shape. To letters sent out to a number of manufacturers, making inquiry as to the most desirable time to hold such a show, responses were received, all expressing a preference for the fall season, and offering their heartiest co-operation towards making it a complete and representative exposition. The dates selected are from Saturday, November 10, to Saturday, November 24, inclusive, and of course ample time will be allowed for installing and removing exhibits. It is considered an advantage that the Horse Show will be held during one of these weeksfrom November 19 to 24. There are each year something more than 50,000 out-of-town visitors to the Horse Show, and practically the same people will be interested in automobiles.



The dates chosen for the Automobile Show will therefore make it practically certain that the attendance and visitors to the Horse Show will also be secured for the Automobile Show. Grand Central Palace, covering a city block from 43d to 44th street and Lexington avenue, to Depew Place, has been chosen for the exposition, because it has the largest exposition space and will permit a more comprehensive show. One hundred thousand square feet of floor space are available for automobile exhibits. and the only other exposition building in New York offers a total floor space of 34,000 square feet, which space, for a number of reasons—as several manufacturers of automobiles know from experience-is not desirable for exhibiting heavy vehicles.

WILLIAM HEAL, ex-county treasurer of Marion, Ind., who has been experimenting with a device for melting glass by electricity, has made a second test, which is more successful and gratifying than the first. He is now confident of the value of the invention. He contemplates several changes before putting it to a practical use.

THE Kern Incandescent Gas Light Company has just closed a ten-year contract with the City of St. Louis to equip 11,000 street lamps. There was considerable competition for this contract between the Kern and Welsbach companies, which was won by the former.

THE London "Daily Mail" says: "For two years the war office has been testing an electrical position finder, invented by an Australian named Alcock, who says that his invention will give the range and bearing of a fixed or a moving object, and at the same instant will give information to any number of fortress guns attached by wire to the instrument, thus enabling a hundred guns, for instance, to concentrate their fire simultaneously on a single ship. It is to be hoped that the war office will arrive at a decision before the invention is offered to the United States."

AUTOMOBILE clubs are springing into life at a rapid pace. The Automobile Club of America has its headquarters at New York, and already Chicago, Boston, Cleveland and Philadelphia have completed the organization of clubs. The Cleveland Club is to supplement the annual Decoration Day bicycle track and road races by an automobile race.

THE Pittsburg "Post" on the 22d inst. contained the following: "One gigantic combine is to fight another in the electric supply business. Contractors, who have taken work on contract for the year, have taken steps to protect themselves against the combination of supply houses, now forming in New York. If the combine in the metropolis meets with success, it will have to combat one of the strongest organizations of capital and skilled labor that the world ever knew. In all the leading cities of the country associations of the contractors have been organized. These associations have made contracts with the skilled workmen, and a compact has been made that will make itself felt. Pittsburg figures prominently in the proceedings. The association of electrical con tractors of Western Pennsylvania is about ready to organize, and a meeting will be held in Pittsburg within the next ten day. A national organization is asked for by a circular that is ready to be mailed to all of the contractors of the United States and Canada. As has been published in telegraphic dispatches, the

supply men are about ready to do business on a combination basis. The building boom is on and a big advance in prices is expected. The contractors have made their contracts with the builders and with their workmen at fixed prices, and an advance in supplies will cause a loss of money to many."

It is reported that from thirty-five to fifty motor vehicles will take part in the thousand-mile race of the Automobile Club of Great Britain. The distances to be traversed daily vary from eighty to one hundred and twenty-four miles. The race will be run about the 1st of May.

# SOCIETY NEWS.

# American Institute of Electrical Engineers.

The 140th meeting will be held at 12 West 31st street, New York City, this (Wednesday) evening at 8 o'clock. A note on "A Farad-Meter" will be presented by Dr. M. I. Pupin. A paper will also be presented by Edward C. Boynton, entitled "Notes on Electric Traction Under Steam Railway Conditions."

Applications have been received from the following candidates for associate membership, which will be acted upon by the council at its meeting March 28:

Fred. A. Fish, Columbus, O.; A. N. Shaw, Brooklyn, N. Y.; Harry B. Marsh, Indianapolis, Ind.; Carl F. Fog, Lynn, Mass.; S. W. Rushmore, Jersey City, N. J.; J. M. Morehead, I. J. Macomber, Chicago, Ill.; M. H. Offinger, Buffalo, N. Y.; Chas. C. Stutz, Max D. Baron, New York City; J. W. Esterline, Lafayette, Ind.; F. O. Blackwell, Schenectady, N. Y.; J. D. Mortimer, A. C. Babson, Berkeley, Cal.

# The New York Electrical Society—203d Meeting.

At the 203d meeting of the New York Electrical Society, which will be held at the College of the City of New York, Lexington avenue and 23d street, on Friday, March 2, at 8 P.M., Dr. A. R. Ledoux, who will lecture on "Copper from the Ore to the Wire Bar," will describe the characteristic ores, exhibiting specimens, also the three types of mines from which copper is obtained in this country, those of Lake Superior, Arizona and Montana; giving an outline of the metallurgical process employed in each case, and exhibiting specimens of the product in different stages of retinement. Dr. Ledoux will also give valuable statistics of the growth of the industry and its present development.

# Sparks from the Point of a Lightning Rod.

I have an extract from a letter from one of your correspondents calling attention to the appearance of sparks at one of the five points of a lightning rod.

My experience during hundreds of kite ascensions with steel and copper wire is that a spark of atmospheric electricity appears only when the kite and wire are insulated from the earth by a wooden winding reel or other insulation, and only then when the wire is made to approach within a fraction of an inch of an iron rod driven into the ground. If the kite and charged wire are very high in the air—and the spark will leap farther in proportion to the altitude of the kite—then the sparks pass so rapidly that they form an arc or a light of small candle power.

I can only try to account for the appearance of a spark on the upper point of the lightning

rod on the assumption that a highly charged layer of clear air—perhaps vapor laden and yet not misty—was within a short distance of the ground and so caused an evanescent brushlight, which by paling and then again glowing brightly might produce the effect of a spark. At night this glow can be readily seen if the edge of a woolen garment is made to approach the highly charged steel kite wire with which I am working. But this glow in the darkness only takes place with the near approach of objects negatively charged at the earth as compared with the positive charge of the kite wire extending up toward the positively charged clouds.

These facts do not enable me to account for the phenomenon observed by your correspondent, but they call attention to a singular analogy.

WILLIAM A EDDY.

Bayonne, N. J.

# National Electric Light Association Convention.

The Central Passenger Association have granted a special rate of a fare and one-third on the certificate plan, from all points in their territory to Chicago and return, for delegates and friends attending the twenty-third convention of the National Electric Light Association, to be held in Chicago, May 22, 23 and 24 next. It is expected that the various other passenger associations will announce the same concession at an early date.

### LONDON NOTES.

# [From our London Correspondent.] Estimates Wanted for Electric Tramway Plant.

The Durban (Natal) Corporation is inviting tenders until April 2—therefore this intimation should be in time to be of service to American contractors who do not happen to be represented in England—for the laying of 14.36 miles of equivalent single track and the bonding of 2.96 miles of equivalent existing track. The Corporation of Durban will lay the concrete foundations and make up the roadway but the tenderers will have to be prepared to supply: 1,900 tons of steel girder rails; 64 tons of fish plates (including the necessary quantity of fish bolts, nuts, tie bars and electric bonds), and 407 loads of Australian hardwood stringers with the necessary quantity of dog spikes, etc.

Tenders have to be sent to the town clerk of Durban by Monday, April 2, in duplicate. Specifications, forms of tender, etc., can be obtained from the London agents to the Corporation, viz., Messrs. Webster Steel & Gompany, 5 East India Avenue, Leadenhall street, London, E. C.; a deposit of £10 10s. has to be sent with applications for specifications. If tenders are sent to the London agents they have to be delivered by Thursday, March 8.

Some large electric car contracts are going just at present, including 200-300 motor car trucks, motors and equipment for same for the Glasgow municipal tramways, which have already placed large orders with American houses for electric traction engines, generators, cables, etc. It will be no great surprise to English contractors to hear that this contract has gone to America.

Another announcement which may perhaps interest Americans is to the effect that the Coatbridge town council is anxious to receive proposals from companies willing to lay down a system of electric tramways in that town



## CHARGING AUTOMOBILE STORAGE BAT-TERIES FROM ALTERNATING CIRCUITS.\*

BY V. M. WEAVER.

In nearly all of the larger cities at the present time are automobiles, and the number is increasing rapidly. Of the three methods of propelling them, the electric is reasonably sure of being found in all of these places. For charging the batteries of these carriages, direct electric current is necessary, but many of our cities have outgrown the earlier Edison direct-current systems, and the alternating current lines reach the outlying and newer parts of the cities. Charging stations established in such places for renewing the batteries of public and private automobiles must use some method of changing this alternating current to direct-current for such purposes.

To accomplish this a rotary converter, which is a dynamo electric machine having its armature wires connected both to a commutator and to rings, or a direct-current generator driven by an induction motor may be used. Of these two, the rotary converter is seldom used, since a synchronous motor is hard to start and trouble often occurs. The induction motor of the latter device is self-starting, and on this account is being adopted for this service. The demand for such outfits is sufficient for manufacturers of electrical machinery to build outfits especially intended for this purpose.

An outfit of this kind, built by the Wagner

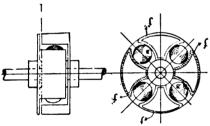


Fig. 1.—Friction Clutch.

Electric Mfg. Co., of St. Louis, is very compact, and is easily set up and operated. The winding of the motor gives a loop terminal which is used only when the motor is being brought up to speed, or in case an overload is thrown on it. The field coils are wound for either 100 or 200 volts.

The connection between motor and generator is by a friction clutch, the bearing surfaces being a set of solid rubber balls, as shown in Fig. 1. In sizes above six kilowatts capacity more balls are used. Perfect insulation, noiseless separation and great flexibility are secured.

The charging outfit of the Illinois Electric Vehicle Transportation Co's station at 47th street and Cottage Grove avenue, Chicago, is illustrated in the diagram Fig. 2. Two nine kilowatt outfits of the style shown are used. The generators give a direct current at 125 volts. In the diagram, T is a reducing transformer, from 1,100 to 110 and 110 volts, so arranged that when the double-throw switch S is up a current of 110 volts is impressed on the motor to start it, and when the switch is down a 220-volt current is thrown on. This brings the motor up to speed, and continues to run it. F is a rheostat in the field circuit so as to maintain a constant pressure of 125 volts.

Only two charging connections are shown, the others in the station being the same as these. At P P are the plug holes in which are

inserted the terminals of the flexible cords with which connection is made to the batteries. In each circuit there is a regulating rheostat, R. A volt and ammeter switch, A, is so arranged that by a cross-arm the outer opposite clips may be short-circuited respectively to the inside and outside rings. This connection enables-the attendant to read both the current and pressure in each circuit.

The battery is removed from the cab for charging, being drawn out on a truck. It con-

introduces the modern machinist to a field of unlimited possibility requiring most exact knowledge of new and constantly changing methods; and the experience of all employers testifies to the difficulty, if not the impossibility, of securing the requisite knowledge and skill in the machinists of to-day.

If the position of machinist is a hard one to fill, what is to be said of that of foreman? At a recent meeting of managers it was stated that 200 young men suitable for foremen for

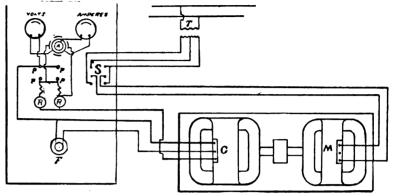


FIG. 2.—PLAN OF CHARGING PLANT.

sists of 48 cells with a normal discharge rate of 30 amperes. In charging it is the practice to commence with a 40 ampere current and continue until the battery takes 10 or 12 amperes at 125 volts, when it is ready to take the place of an exhausted predecessor. A truck carries it to the cab whose battery it is to replace. After every trip, whether the run is long or short, the battery is replaced by a newly charged one, and the driver, on leaving a station, always knows what he has to depend on. The company has a number of these charging stations distributed about the territory covered by its vehicles.

# EDUCATION OF MACHINISTS, FORE-MEN AND MECHANICAL ENGINEERS,\*

BY M. P. HIGGINS, Worcester, Mass.

# DEMAND FOR TRAINED MECHANICS.

While it must be admitted that during the past twenty-five years most gratifying progress has been made in American mechanical engineering and in the education of mechanical engineers, yet it is evident to the managers of our mechanical establishments that there is a great lack of competent mechanics below the grade of mechanical engineer to take the increasing demands and responsibility of the work and properly carry it out.

The standard of the work of the machinist has rapidly moved forward in refinements and complications. He is called upon to read and understand intricate drawings, and to make quickly and with certainty very exact measurements and computations in the shop. He must deal with tempered steel for almost numberless uses and for the severest requirements. Hardened steel parts must be fitted to an extent and with a precision never thought of twenty-five years ago. This practice of machine construction will be introduced to an unlimited extent in the future, necessarily making many changes in methods, as, for example, the substitution of grinding for filing, which will secure so much better results. This

foundries could be placed at once. Nothing is more difficult than to find men capable of filling such positions. Indeed, I have expressed the opinion, and I believe it will be confirmed by others, that the most difficult position to fill when a machine business is to be organized is that of shop foreman. The positions of president, treasurer, mechanical engineer, salesman, etc., need not wait a day for applicants, but the man who is fitted to manage the practical details of a machine shop successfully is a rare man, and there is no scientific or professional man whose services are in surer demand than his,

Is it not wise, economical shop management which is giving us the leading position in the machine markets at home and abroad? This is what we expect the good foreman to exhibit. The ability to produce a very fine and exact piece of work in a machine shop, regardless of time or method, will not insure success, but, on the other hand, will be most apt to induce failure. It is the shop which can build the best machinery at a less cost than others which is sure to be successful; and to secure this the management must depend upon no man more than the shop foreman. He must ascertain all possible legitimate ways and means for reducing shop costs, stopping leaks and losses, without reducing the manliness of the men and the standard of the work. How many men of this kind do we get, and what opportunity is there to-day for training for such positions?

With this great and growing Temand of the profession, and with the splendid opportunities open to young men who will fit themselves to be mechanics, and who in turn are demanding of the profession the chance to fit themselves, the question is forced to our attention: How are these needs being met?

# IMPORTANCE OF GETTING ABOUT LIFE'S WORK EARLY,

It is quite generally considered the wisest policy to advise young men to lay patiently a broad foundation in school and to be content if the life work is fairly entered upon at from twenty-five to thirty-five years of age. But there is a gradual change of opinion taking place among many educators, and they are coming to believe that the most receptive period is under twenty years of age. There-



<sup>\*</sup> From "The Automobile."

<sup>\*</sup>Abstract of paper read at the annual meeting of the American Society of Mechanical Engineers, held at New York, December 6, 1899.

fore, aside from the necessity under which a poor boy labors, who has his way to make in the world as a workman, he should early be induced to look forward with a fixed plan and purpose to his life work, and there should be given him, in some suitable school, fundamental training which should fit him for his occupation. On the other hand, this must not limit him, as it should lead directly through the successive grades toward the highest professional work of that industry which he chooses.

# FAILURE OF THE TECHNICAL SCHOOLS TO REACH THIS CLASS.

Never was there a national movement more timely or more successful in its introduction than the movement looking toward the establishment of technical schools thirty-five years ago in this country, supplemented as it was by the educational land grant act in 1862. We naturally expected at that time that this movement would meet not only the higher education of engineers, but the needs of mechanics. which this paper emphasizes. Perhaps, however, it was too much to expect that these schools, under the management of professional educators, the most able and suitable that could be selected at that time, could have accomplished so much or covered more ground than they have. It is most natural that each technical school management should be greatly influenced by the college education and academic professionalism of the men who conduct it, to whom were entrusted the relations of academic and practical departments and those of theory and practice. This has resulted in a tendency to produce scientists and not mechanics.

It is not the policy and intention of engineering schools to put sufficient time and stress on shopwork to allow the student to attain thorough practical skill. He very readily receives the impression that an engineer need not work with his own hands, though he admits that he should know how the work should be done by others. To be a thorough mechanic, which he ought to be before he can be a well-trained mechanical engineer, he must be able to do the work, and this the present technical school does not teach thoroughly.

The gulf between the work of the schools and the shops has sometimes been called a difference between theory and practice: but the real variance in educational attempts is between men, between the mechanic and the schoolman, betwen the machinist and the engineer. Brave attempts have been made to bring the two together, but with partial success only. In one of our most prominent and practical engineering schools a professor had designed a commutator which required sections cut from a metal ring. The professor ordered two rings, so that a piece from the second could be used to make up for the loss in cutting up the first. The machinist said, "Let me make one ring only, somewhat larger than you want, cut it up, and then turn it to the exact size; and thus save the cost of the second ring." "No," answered the professor; "I am doing the engineering, I want you to do the work." I state this actual occurrence, as one of many llustrations which might be given, to show that the two have not yet joined work even in the technical schools. It is not always an easy matter to secure this necessary union, and even where it seems to be attained it is not always complete. It can be secured by having both vital parts in one and the same man. And it is exactly this union that the proposed

system for training mechanics is designed to secure.

The very surprising fact that the total number of students in technical colleges in this country is at present on the decrease, may suggest that some changes in the engineering courses would better meet the needs of a larger class.

### RAISING OF STANDARDS OF ADMISSION.

I would also mention that with the tendency toward the abstract and scientific which has been referred to, has come the raising of standards for admission from year to year, so that the technical school has become more nearly on a par with the college than it was when it started; and this puts the school beyond the reach of boys who are to make workmen and also beyond the reach of many who would make engineers.

# ANOTHER UNFORTUNATE RESULT OF THE TECHNICAL SCHOOL.

As a result of the technical school overlooking the needs of the large body of mechanics and devoting themselves to the production of scientific professionalists, they produce an enormous amount of discarded material, men who are neither fit for workmen nor engineers, men who are not at the start fit to become successful engineers.

In a class of one hundred in an engineering college, if only five make engineers such as the course is aimed to produce, the ninety-five others have not, in all probability, received a course of training well fitted for their special needs and capacities. Further than this, the large portion of the class who are, to some extent, failures are also frequently disappointed men.

There are many reasons why the young man who enters an engineering school is allowed to get false ideas regarding his future. He understands that there is a lively demand in the active world for technically trained young men. He likes the idea of being an "engineer," and he knows that all the leading technical schools have high-grade engineering courses, the requirements are up to the colleges, and he expects when he graduates he will be able to engage in engineering work. When he finds that he either cannot do engineering work at all, or that there are ten engineer graduates to one position of that particular kind, and that every year the demand for professional engineers grows less and the graduates more numerous, he turns his attention reluctantly to a lower grade of work and is never quite satisfied or happy in it. He feels that he was born and educated for something better. But was he? No. He only thought he was. His failure would be no fault of the school, however, if he had not been, in a sense, educated away from the work that he is obliged to undertake. These "culls" from an engineering class are not first-class material for workmen in any department below the engineer. Such a man is a disappointment to himself and to his employer And though we may be able to show that every graduate in a class has been greatly benefited and developed during the course of study, yet that is not a sufficient reason for a course fitted only to the very few and which allows the large majority to come to their disappointment through the general understanding that, if they were graduated, they would be engineers because they were graduates.

## OVER-SUPPLY OF POLYTECHNIC ENGINEERS.

We must remember that mechanical pro-

gress is very dependent upon the capitalist. The proprietor who stands behind the work is more inclined to trust his engineering to his own men who have grown up in the works and have, in some way or other, picked up science enough to get on with considerable success. The proprietor is not inclined to put his work into the hands of a professional engineer who works on the same problem for other clients, and he is less inclined to employ special engineers. When this is done at all, one engineer is employed by several concerns, and his time divided up among them.

This lessened demand for polytechnic graduates was recognized several years ago in Europe, and some slight attempts were made to remedy the evil. As early as 1885 the British commissioner found in Germany an excess over the demand, of 1,000 well-trained polytechnic graduates, and they were informed that the manager of a large engineering works had been so importuned by these young men for employment that he put a notice in his window, "No polytechnic student need apply.' The Baron von Eybesfeld, Austrian Minister of Instruction, stated that the most serious problem in education in that country is to reduce the number of theoretical engineers (who, after their long course of study, find themselves not wanted) and to increase the number of men in whose training theory and practice had been so combined that they could meet, the great demand for those who can put theory and practice together. This statement, taken from a report of Technical Instruction in Europe, by the late C.O. Thompson, formerly president of the Rose Polytechnic Institute, and published by the United States Bureau of Education, is followed by another statement which shows that the tendency of the technical schools toward a par with the college, referred to above, was fully recognized and admitted at that time. This statement says: "There is a constant and apparently irresistible tendency in all the lower schools to pass up into the higher by imperceptible advances. For example, at Chemnitz, what used to be the Gewerbeschule has ranked since 1879 as a polytechnic school. But so true is it that a school of higher education never loses or departs from the cast it receives in the first ten years of its existence, that the old polytechnics, modeled largely after the Ecole Polytechnique of Paris, have so steadily held to the theoretical training of engineers that the times have swept past them. The efforts now making in Austria to romedy this evil are more to the point than any others in Europe, but they are directed towards the artisan rather than the engineer."

# PROPOSED SOLUTION OF THE PROBLEM.

The proposed solution of the problem lies in the answer to the question: "How can we give our boys a chance to learn a trade without being deprived of a good common school education, and at the same time secure a foundation upon which to build a higher education if capacity and circumstances permit?"

The half-time school, established upon the plan outlined below, will, it is believed, answer this question and solve the problem.

This school is aimed to fit each boy for the successive grades of mechanics from the machinist up, so that at any time he will be fitted to take up his work outside as a well-trained mechanic in the grade which he has completed and be prepared to enter the training of the next grade. In other words, the object of the school is to produce many well-trained and educated machinists, and from these ma-



chinists some foremen, from the foremen a few superintendents, and finally an occasional engineer. The character of the individual material in ability and natural aptitude determines the grade of the product of the school, whether workman, foreman, superintendent or engineer. The plan will be understood by a brief statement of its prominent features, which will be discussed more at length below.

#### CHIEF FEATURES OF THE HALF-TIME SCHOOL.

First-A school which shall include a firstclass commercially successful and productive machine-shop, which is a department co-ordinate in importance, influence and educational value with the academic department.

Second-A school in which the pupils are to have instruction and practice in this shop during half the working hours in five days of each week for a period of four years.

Third-Instruction in the public schools during a portion of the other half of the time. equivalent to a high school course, restricted, abridged, and improved to meet the needs of these pupils.

Fourth-Special care and method of selection of pupils who have finished the grammarschool course and who have special aptness for mechanical work.

Fifth-Management under a corporation whose trustees shall be practical business men.

Before proceeding to a discussion of these features it seems well to say a word upon the principle already briefly stated, which lies at the foundation of this school -namely, the education of one period leading to the next, so that there need be no break or limit until the most complete education of the engineer is finished.

### EDUCATION COMPLETE AT EACH STAGE.

The main thing which should determine the point where schooling had better be stopped and the real life-work begun is the natural endowment of the pupil, so that whenever he stops he has received the best possible course of schooling and training for his particular career, whether it be as machinist, draughtsman, foreman or manager. And if he has aspirations and natural ability for some position higher, not within the scope of the half-time school, this course may lead to the technical school. Thus he has no back steps to take nothing to unlearn, and nothing which he might better have left out. He is not handicapped by lack of preparation to enter the technical school. When he enters the halftime school be need not give up his aspirations for this higher education, as is the case to-day if he leaves the public school to learn a trade: he has not burned his bridges behind him, but all that he has attained in the half-time school is the best possible understructure for his higher work, even if he becomes an engineer and undertakes the most responsible engineering works devolving upon mankind. If he is not adequate to undertake such work, it should not be the fault of his school training, but due to the limit of his natural capacity. "Many are called, but few are chosen." We need not grieve at the very few chosen, because but few are required. But few professional engineers can be employed provided the greatbody of working mechanics are effectively educated to think clearly, keenly and quickly. To produce such mechanics is the first object of the half-time school.

This school begins with the education of the masses as machinists, and then by natural selection promotes to the grades above. The

selection and elimination begin at the bottom and proceed upward, rather than, as is now the case with the technical school, beginning at the top and proceeding downward, dropping a large number because they are failures. In the half-time school, if the boy's natural capacity or the lack of demand fails to take him into the position of engineer, yet he is a success as a working mechanic in one of the grades below, and when a boy drops out for any cause, he drops on his feet.

We may hope for much from a thousand educated, thinking, expert American machinists, who have the skill, education and an exact knowledge of the shops. Is not the production of one hundred well-educated workmen a more certain undertaking than the production of one genius? There is certainly no impassable gulf between the ideal engineer and the great body of workmen. If there was, there would necessarily be one school for engineers and a different one for workmen, another for laborers, another for foremen, another for superintendents, another for managers, etc. In the half-time school all grades may go on together as far as possible.

The real engineer, in consequence of superior natural fitness, carrying capacity for knowledge and practical experience, and cultivated mental faculties, is a superior man to his fellows. His superiority over and above the mechanic, or machinist, I insist, however, is a difference of degree and not a difference of kind. All should begin in the same school. The engineer is superior because he takes more, and he takes more because he has the capacity to carry more. Therefore, he cannot afford to be minus any good thing which the man below him possesses; he can afford to have all the specific shop knowledge and practical experience of the workman below

The Alpine explorer does not approach the highest peaks from the clouds, but he walks from the foot hills with his fellows, some of whom never go above the pastures, others never above the slippery glaciers; but he that is fittest keeps step with each and every one so far as each can follow. The hero takes every step that the plodder takes: the only difference being that each step of the better man is surer and bolder, and all along through the simple things a promise of higher things is evident. Every step the hero makes is an inspiration to his comrades, and sure progress to himself. But finally he goes onward and upward, more and more alone. Something of this sort of superiority, I believe, may result from a proper natural training for mechanics, where each boy is inspired by the progress he has made, and consequently feels more and more intensely fixed upon taking the next step upward.

In the present school system the young man may look forward to some higher position he vaguely hopes for, but it is frequently late in life, if ever, that he gets the better help which comes from looking backward over daily achievements (such as I believe a half-time school with large shop opportunities can give) all along the way from his humblest experiences. Not only when the pupil leaves school he steps upon a level of work for which his schooling up to this point has fitted him in the best manner, but furthermore, he has been fitted in the best manner to take the next higher work in school at once, or after a year or two of shop work for the sake of money earning, thus enabling him to take a higher course in an engineering school.

#### THE STANDARDIZATION OF AN ELEC-TRICAL ENGINEERING PLANT.

### BY R. PERCY SELLON.

To the user of an electrical engineering plant, not less than to the producer, the subject of ts standardization is one of great practical importance.

By "standardization" is meant the general acceptance, to a far greater extent than at present obtains in this country, of certain tandards of output, quality, efficiency, or other characteristics of an electrical engineering plant, to meet ordinary requirements of usage for light, traction and power.

1. Of the four chief ingredients of successful competitive production, viz.: (a) cheap labor (not to be confounded with low wages); (b) cheap materials; (c) efficient management, and (d) repetition manufacture, much has been said and written of the first three, but little of the last. And yet every manufacturer of experience knows that it is as influential a factor in determining not only his own profit, but decisive advantages to the user, as any of the factors of labor, materials or supervision. In order to convince oneself of this, it is only necessary to consider the influence of repetition manufacture upon the price and reliability of any article of common use-say, in our own industry, incandescent lamps and their accessory fittings, in respect of which some measure of standardization has been evolved; and to reflect what, on the other hand, the cost would be if many manufacturers or users adopted different standards.

In the early years of an industry, experiment and development by trial and error are desira ble and inevitable in order to ascertain the possibilities and limitations of the art. But as the stage of repetition public demand is reached, standardization becomes increasingly possible and advantageous.

Its advance is, however, liable to be retarded by a number of causes, notable among which are the folly of some producers, and the ignorance of many users.

There are always some manufacturers who think that by supplying a special or unique type of apparatus to the buyer they will force him into placing his future orders with them. Hence they resist any tendency towards standardization.

There are also many buyers who allow themselves to be persuaded into the belief that in securing something new and different from previous usage they are doing well for themselves and giving evidence of superior intelligence; whereas the probability is that they are paying a higher price for a less reliable article.

There is a third class who believe that standardization is the business of the producer only; and that the user need not concern himself to assist in bringing about a condition of things for which every manufacturer who knows his business eagerly strives. This view is erroneous.

The intelligent producer is undoubtedly deeply concerned in the advent of standardization; because it means for him the possibility of repetition manufacture—on the manifold advantages of which it is not necessary to dwell.

But to the user, if he would only realize it, the fruits of standardization are equally beneficial; for they involve for him the following advantages:

<sup>\*</sup> Paper read before the Institution of Electrical Engineers, London, Feb. 8, 1900.



- (a) Less capital outlay.
- (b) Prompt delivery.
- (c) Immunity from the risks attendant on novel designs.
- (d) Full manufacturer's guarantees.
- 2. Viewed from the "patriotic" standpoint, this subject acquires also special significance in these days of acute struggle between British, American and Continental manufacturers for our own and the world's markets in electrical wares.

The causes which underlie the ability of American and Continental producers to compete keenly and successfully with the British electrical manufacturer are several, and generally outside the scope of this paper. But conspicuous amongst them is the fact that the former have (as any one who has visited their leading workshops can testify) attained to a degree of repetition manufacture superior to the British producer.

This fact is so noteworthy as to constitute in itself a telling argument in favor of increased standardization among us; for the flood of the American electrical engineering plant into Great Britain is swelling in spite of the fact that we have the advantages of lower wages (on the whole), cheaper materials and a longer experience of factory organization.

3. It therefore becomes important to endeavor to trace the cause of this preferential position held by our foreign rivals. The explanation would appear to lie in a difference of procedure.

According to American and Continental practice the producer determines, in a large measure, the character of the plant employed by the user; while according to British custom the buyer very generally imposes upon the manufacturer not merely a specification of the ends he wishes to attain, but the details of means by which he desires those ends to be achieved.

This is due to the fact that under the American and Continental system producers largely secure outlets for their manufactures through the agency of powerful financial organizations created by and allied to their interests, who are concerned simply with commercial results, and are content to leave the technical means of attaining them to the manufacturing interests with whom they co-operate. In America these organizations take the form of colossal trusts or consolidations of competing interests; on the Continent that of industrial banks. In either case there is a close relation between producer and buyer.

In Great Britain, on the other hand, the demand for an electrical engineering plant in recent years has issued chiefly from local authorities, or from private users unconnected with any manufacturing interests; and these have very naturally had recourse to electrical engineers acting in a consulting capacity or passing permanently into their service, to guide them in the choice of plant to fulfill their requirements.

That the practical operation of this system in the past has been primarily responsible for the relative absence of standardization in this country, with its attendant evils alike to user and producer, appears certain. For the user's engineer has frequently been out of touch with manufacturers, and the temptation to strike out on new and "showy" lines, suggestive of individuality, ability, or foresight, has, in the very nature of things, been great. The result has been the issue of specifications too often calling for wanton divergen-

ces from previous practice or existing manufacturers' standards.

The source of the evil is traceable to the fact that the buyer's engineer has gradually overstepped the rational function of stating the ends or performance required by the buyer, and has proceeded to specify in minute detaithe means or constructional methods by which the required results are to be achieved, with out taking responsibility for the result.

It is not necessary to adduce specific examples in illustration of this statement, because the author believes that it is one which not fair-minded electrical engineer acquainted with the facts will dispute. There is not difficulty in producing overwhelming evidence of its truth if such be required.

To the same primary cause may probably be traced the variety in size and character of the power units in many of the central stations of Great Britain-another instance of "splendid isolation" in our methods; for foreign prac tice is at one in adopting fewer and larger units, uniform in size and character from the commencement. Whether advantages of temporarily reduced capital outlay and higher efficiency under our system are a sufficient com pensation for loss of interchangeability and periodical relegation of plant to the old metal market, remains to be proved when the bills are presented later on and contrasted with one another. Meantime it is interesting to note that one result of our procedure is the comparative unreadiness of British manufacturers to compete with foreign producers in the common markets of the world as regards large units.

4. Whether British collectivism is on the whole a more healthy medium than American or Continental private enterprise for the progressive growth of the electrical engineering industry is a large question outside the scope of this paper. We have here to accept it as a fact, and consider whether an evil which it has brought in its train is a necessary one, and if not, how it can be averted for the future.

Assuming, then, that the buyer's engineer has come to stay, it would appear that a condition precedent to the standardization of plant is the standardization of the buyer's engineer.

The fundamental fact requiring appreciation is that standardization, to the greatest degree possible, is in the interest of the user at least as much as that of the manufacturer.

From this we may pass on to postulate that standardization is primarily the function of the producer and not of the user or his engineer, because the former is in a better position to determine, experimentally and by his more intimate knowledge of the means of production, the direction and extent to which it is possible. Inasmuch as the manufacturer's success is dependent on the judgment with which he creates or responds to public demand, there exists always an efficient safeguard that he will not (consciously) standardize on unsuitable or inefficient lines.

The user, on the other hand, is of course the proper judge as to the results he wishes to achieve.

It would appear, therefore, that the initial obstacle to a greater measure of standardization than at present obtains would be removed if the user or his engineer would confine himself to stating the ends he has in view, leaving it to the producer to furnish the means whereby they may be attained.

If this procedure was adopted users would still retain full liberty of choice between the

products of different manufacturers, while the latter would have an opportunity (which under the present system of detailed specifications they do not enjoy) of undertaking repetition manufacture, assuming that they have sufficient confidence in the substantial harmony between their designs and public requirements to take the risk of quantitative production.

This system would have the incidental advantage that the producer could then be properly called upon to guarantee results, since the responsibility of selecting the means to attain them would rest exclusively with him. The present custom too often imposes upon the manufacturer a mass of fantastic detail emanating from the brain of the user or his engineer, for which he is called upon to take responsibility; an illogical system which can only be compared to the proposition that every man should be expected to father another man's child.

It may be objected that the general adoption of the course suggested would lead to stagnation in development, and that the producer, relieved from the constant pressure of change now exerted by the user, would settle down to the perpetuation of antiquated designs-to the disadvantage of the public and the fetich of progress. The answer to this is, firstly, that much of the change hitherto demanded has been wanton and retrogressive; secondly, that competition within the ranks of manufacturers themselves must always prove a sufficient stimulus to keep abreast of public demand; and finally, that it is largely by the adoption of the system suggested that American and Continental producers are snatching trade from the British manufacturer in his own market.

5. If, then, the principle be accepted that standardization, with the qualification named, is for the advantage alike of producer and user, we may pass on to consider how far, and by what means, it is capable of beneficial extension.

Standardization pre-supposes such a substantial and sufficiently enduring demand for an article as to make it worth the while of manufacturers to incur the requisite outlay in time and money to achieve it. Hence, as already mentioned, in the early and experimental stages of an industry it is neither possible nor desirable. The period at which it becomes practicable is largely one for the judgment of producers. But from the preceding argument it is evident that the user plays an influential part in hastening or retarding its advent-as is proved by the fact that standardization is much further advanced for the same character of products abroad than in Great Britain. This clearly indicates that it is the system in this country, and not the infancy of the industry, that is responsible for this condition of affairs.

Standardization, to be enduring, must proceed on lines which shall be beneficial alike to the producer and user. It follows that any attempt to stereotype detail of design or construction must ultimately fail in its object. because such a course will not be adapted to the varying manufacturing facilities of different producers; nor will be acceptable to the user, since it must prove restrictive of constructional improvement and involve the buyer in paying a higher price for an article which the producer will decline to effectively guar antee. In other words, enduring mutual advantage to producer and buyer will only result if standardization be confined to ends or performance, and not to means or constructional detail.

Under the term "ends" or "performance" as opposed to "means" or "constructional detail" would fall the following:

- (a) Steam pressure.
- (b) Electrical pressure of generation.
- (c) Electrical pressure of distribution.
- (d) Periodicity of alternate current generation.
- (e) Sizes of generating steam units (say in convenient fractions or multiples of horse-power or kilowatts).
- (f) Sizes of mains, say in convenient fractions or multiples of a square inch or other unit).
- (g) Sizes of motors, and similarly as regards transformers, are and incandescent lamps, and essential fittings and accessories.

That much can be done in this direction is evidenced by the ease and rapidity with which, as regards electric traction, we have acquiesced in the standards of pressure, general construction, and types of motors, trucks and accessories, prevalent in America. There can be little doubt that had practical electric traction originated with us, instead of being an imported art from the United States, we would still be in the stage in which buyers' engineers would be creating different "standards" of their own composing, while every producer would be expected to manufacture and guarantee a corresponding variety of designs.

The author understands that most of the leading electric cable manufacturers in this country have already adopted, by agreement among themselves, certain standards in their own department of production. The question of standardization has also for some time received attention at the hands of the Electrical Engineering Plant Manufacturers' Association. Again the Municipal Electrical Association, a body thoroughly representative of the municipal user's interests, has given evidence of its readiness to co-operate with manufacturers in the direction of standardization of the commercial conditions of contracts for an electrical plant. Its representatives have met in conference representatives of the Electrical Engineering Plant Manufacturers' Association and have agreed upon certain general conditions as a basis for specifications of plant required by local authorities, and the outcome has undoubtedly been beneficial. It is evident, therefore, that the whole subject is ripe for consideration on the broader basis of harmonizing, by adequate representation and discussion, all sections of users' interests with those of producers.

6. It is not possible to enter in this paper upon the consideration of the actual formulæ which might constitute standards for the future. This is a very large and important question demanding much careful thought and discussion. The machinery for this purpose already exists, at any rate as a nucleus, in the Uniformity Committee of this Institution, appointed shortly after the submission of a highly suggestive paper on "Uniformity of Plant," by Mr. C. H. Wordingham, before the Municipal Electrical Association in the summer of 1898. But beyond a word of advice on the subject of standard periodicities, nothing has so far issued publicly from the deliberations of this committee extending over eighteen months. At this rate we may become irretrievably committed to many steps which all may live to regret, before effective results are obtained; for an unexampled expansion in every department of electrical engineering, notably those of electric traction and of power

distribution over extensive areas, appears about to take place in this country.

The author ventures to suggest that additional weight and acceleration to the work of the committee of the Institution would be given if it were strengthened by the addition of representatives of all interests concerned, viz., those of the manufacturer, user, consulting engineer, and user's engineer. The Institution might also encourage the submission of papers suggestive of standards for various classes of electrical engineering plant and accessories. These, together with the views which would be brought out in discussion, would serve as a valuable guide to a representative committee.

In conclusion, the propositions which the author has endeavored to establish may be briefly recapitulated as follows:

- (a) Standardization, to a greater degree than at present exists, is in the interest of the manufacturer; as a means of facilitating repetition production, and of meeting the competition of standardized foreign manufactures.
- (b) Standardization of "ends" or "performance" as distinct from "means" or "constructional details" is equally in the interest of the user; by securing for him low purchase cost, prompt delivery, freedom from the risks of experimental design, and full manufacturer's guarantees.
- (c) The relative absence of standardization in Great Britain, in contrast with other countries, is mainly traceable to the prevailing system wherein the user's engineer specifies "means" or "constructional details," instead of confining himself to "ends" or performance."
- (d) The determination of standards by organized effort, rather than by the slow and costly process of "trial and error," is desirable, and should be undertaken under the auspices of the Institution of Electrical Engineers, as representing the interests of both producer and user

## MARCONI AT THE ROYAL INSTITUTION.

(From our London Correspondent.)

On Friday, February 2, Mr. Marconi entertained a large company at the Royal Institution of London with a lecture on "Wireless Telegraphy." He dealt with some of the improvements which had been made during recent months. One improvement consisted of inserting the secondary of a transformer or induction coil in the coherer circuit, the primary being connected with the vertical aerial wire. This induction coil, the function of which was to increase the electromotive force of the induced oscillations at the terminals of the coherer, was of peculiar construction. Coils wound in the ordinary way were useless or even detrimental, but the coil he employed had its primary, contrary to the usual custom, wound with fine wire and its secondary with still finer. Moreover, the wire of the latter was not wound in uniform layers, but in a special manner calculated to prevent the effects due to electro-magnetic induction from being in opposition with the electrostatic induction at the ends of the primary. The efficacy of such a coil he tested during the naval manœuvres, and working between the Juno and the Europa, he found that, while the limit distance attainable without the coil was seven miles, over 60 miles could be obtained with certainty with the coil.

As to the distance of signaling, Mr. Marconi

said it varied approximately with the square of the height of the vertical wire and the square root of the capacity area placed at the top of the wires. With two installations having poles 150 ft. high signals were easily obtained at a distance of 85 miles, though according to a rigorous application of the law 72 miles only ought to have been obtained. It was noticeable in this case that, as the two stations were at sea level, there existed, between, them, a hill of water over 1,000 ft. high, owing to the curvature of the earth, and if the waves traveled only in straight lines, or if the effect was noticeable only across open space in a direct line, the signals would not have been received except with a vertical wire 1,000 ft, high at both stations. The lecturer proceeded to refer to the installations of wireless telegraphy that had been erected between the South Foreland and the East Goodwin light vessel, the South Foreland and Wimereux. But the most interesting and complete tests at sea, he said, were made during the naval manœuvres. The greatest distances at which service messages were sent then where 60 nautical miles between the Europa and the Juno, and 45 miles between the Juno and the Alexandra. That was not the maximum distance actually traversed, but the distance at which, under all circumstances and conditions, the system could be relied on for certain and regular transmission. During tests messages were sent to the distance of 74 nautical miles. Mr. Marconi said that six of his assistants had been sent out to South Africa. The war office intended that the wireless telegraph should only be used at the base and on railways, but the officers on the spot, realizing it could only be of practical use at the front, asked if the assistants were willing to go to the front, and accordingly on December 11 they moved up to De Aar. The results at first were not altogether satisfactory, owing to the lack of poles, kites or balloons, which were essential, but the difficulty was overcome by the manufacture of kites, in which they were assisted by Major Baden-Powell and Captain Kennedy, R. E. It had been reported that the difficulty was due to the iron in the hills, but as a matter of fact iron would have no more destructive effect on these Hertzian waves than any other metal, and he had been able to transmit messages across the high buildings of New York, the upper stories of which were iron. However, when kites were provided it was easy to communicate from De Aar to Orange River-some seventy milesand now there were stations at Modder River. Enslin, Belmont, Orange River, and De Aar. Two of his assistants volunteered to take instruments through the Boer lines to Kimberley, but the military authorities would not grant them permission as probably too great risk was involved. It seemed to him regrettable that installations were not established in Ladysmith, Mafeking, and Kimberley before the commencement of hostilities, but he found it hard to believe that the Boers had any workable instruments. Some intended for them, which had been seized at Cape Town, were of German manufacture, and not workable, and Mr. Marconi said that as he had supplied no apparatus to any one the Boers could not possible have any of his instruments.

A new automobile electric safety block signal, which will stop a train without the assistance of the engineer or motorman, is now being introduced. It is applicable to any style of motive power.

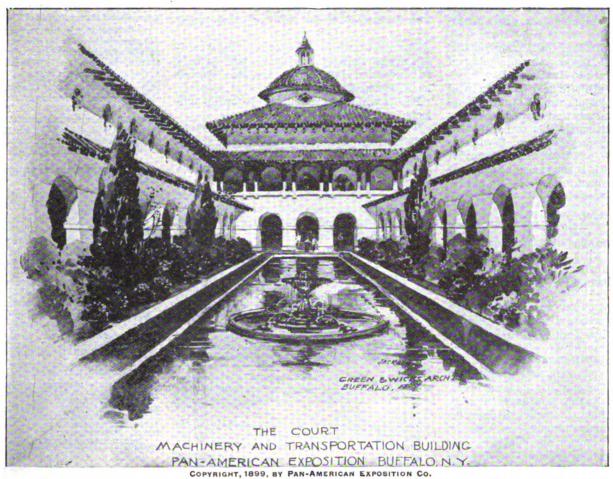


#### PAN-AMERICAN EXPOSITION BUILDINGS

The Court of the Machinery and Transportation Building of the Pan-American Exposition, which will be held at Buffalo, N. Y., on the Niagara Frontier, during the summer months of the year 1901, presents an interesting treatment of cloister work. The Machinery and Transportation Building itself forms a hollow square, with this Court in its center. It is 200

a pleasing frame or border effect; the water is low so as to receive the reflection of the growth around the pool.

The fountain is an important feature, placed in the center of the pool, and giving life to the scene and freshness to the atmosphere. Throughout the Court are pleasant walks and paths, bordered with low-growing shrubbery and plants, and at intervals at axis-points with the arcades, rare plants are placed in great a very free version of Spanish architecture—has suggested the name of the Plaza, which has been given it. The central portion of this square is occupied by a terrace only very slightly raised above the surface of the square, and surrounding a sunken garden, in the middle of which is a bandstand. The terrace as well as the garden itself will afford a large space for listeners who attend the concerts which it is proposed to give.



feet long and 100 feet wide, the east and west ends opening respectively to the great entrances from the Grand Canal and the Court of the Fountains, while the great exhibiting rooms of the Mall side of the building, and the Copyright, 1899, by Pan-American Exposition Co. vases, making a truly architectural landscape effect. The entire scheme gives the effect of an admirable enclosure of a mission cloister, and is planned as one of the many little oasis for the refreshment of the weary sightseer.

Outside, and at the north of the Plaza, is the railway and trolley station, from which it is supposed the greater number of visitors will enter the exhibition grounds. The railway station itself is masked by a colonnade flanked



two exhibition rooms and great entrance court from the Court of the Fountains side of the building, lie on either side. Along each side of this court, and extending the entire length, are roof-covered arcades under which the visitor may find pest on the comfortable benches.

The pool itself is 175 feet long and 27 feet wide. It is placed in the center of the court. The bank is sodded and planted on all sides, forming

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This building and court have been designed by Green and Wicks of Buffalo.

The northern part of the exhibition ground is occupied by a square about 500 feet from east to west and 350 feet from north to south. The buildings bounding three sides of this square and the arrangement of the square itself have been given to Messrs, Babb, Cook and Willard of New York, and the style adopetd—

at either end by two colossal arches, one for those entering the Exposition, and the other for those leaving it. This colonnade bounds the Plaza on the north. It is surrounded by a trellis, which it is proposed to cover with vines of various sorts.

The west side of the Plaza is bounded by a building, which is to serve as a large restaurant. The public pass through the lower arches of

this building, which are open, in order to reach that portion of the Exposition which corresponds with the Midway Plaisance at Chicago. The restaurant building itself is two stories high, and is about 350 feet long.

On the east side of the Plaza is a building closely resembling the restaurant, which serves principally as the entrance to the Stadium or athletic field, although portions are also used for exhibition purposes. This also has two stories, the upper story being a large open gallery, from which views of the Plaza on the one side and the Stadium on the other are afforded.

Finally, the south side of the Plaza is bounded by the Electrical Tower, the designing of which has been given to Mr. Howard.

The Stadium or athletic field has been in all its details a subject of careful study. It resembles in a general way that erected at Athens a few years ago, although this one can be, of course, only a temporary structure. It will contain easily 25,000 spectators, and is intended as a model of what it is hoped may be executed some day in permanent form.

# LEGAL NOTES.

Judge Gilmer has appointed W. G. Hurlbert receiver for the Niles Electric Company of Warren, O. Mr. Hurlbert gave bond for \$5,000. The receiver is directed to run the plant and to pay therefor out of any funds in his hands.

An important decision was lately handed down by the Appellate Division of the Supreme Court in New York City in a suit for refusal to give a transfer brought against the Metropolitan Street Railway by Chas. D. Mendoza. The complainant was awarded \$50 damages, the legal amount, by the lower court, but was reversed by the Appellate Division. The reversal was due to a technical defect in the complaint, which did not show that the line to which the transfer was demanded was actually leased by the defendants. The decision has an important bearing on the local transit and transfer system. It is especially important in that it holds that leased lines come under the provisions of section 104 of the rail-road law. This is diametrically opposed to a road law. This is diametrically opposed to a decision rendered last summer by Justice Maddox in Kings County.

The suits of the Thomson-Houston Electric Company and the General Electric Company against the Detroit (Mich.) Railway were discontinued, by stipulation, in the United States Circuit Court a short time ago. The actions arose out of the alleged infringement of certain patents and have been pending for some years.

An unusual case was recently tried in Rochester, N. Y., before Judge Murphy of the Rochester Municipal Court. Charles V. Thomson and Josephine Thomson appeared against the Western Union Telegraph Company. The plaintiffs, who are contractors for street improvements, alleged that a telegram sent over the Western Union wires was not delivered, and in consequence they lost a contract for paving a street in Elmira from which they would have realized \$800. Judgment was rendered in favor of plaintiff for \$169.81.

## Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended February 17:

Antwerp, 24 cases, \$2,792; Argentine Republic, 175 cases, \$13,042; Berlin, 57 cases, \$425; Brazil, 2 cases, \$19; Bremen, 1 case, \$15; Bris-

tol, 20 cases, \$15,000; British Guiana, 7 cases, \$68; British Possessions in Africa, 18 cases, \$2,-057; Central America, 8 cases \$164; Chili, 27 cases, \$518; Florence, 21 cases, \$2,452; Glasgow, 10 cases, \$1,000; Leith, 13 cases, \$982; London, 14 cases electrical carriages, \$4,080; 89 cases, \$5,204; Manchester, 4 cases, \$1,037; Marseilles, 269 cases, \$24,292; Naples, 1 case, \$66; Peru, 13 cases, \$507; Southampton, 7 cases, \$663; St. Petersburg, 2 cases, \$95; U. S. Colombia, 9 cases, \$217.

#### The American Street Railway Association Convention.

The nineteenth annual meeting of the American Street Railway Association will be held at Convention Hall, Kansas City, Mo., October 16, 17, 18 and 19,

Papers will be read on the following subjects:

"Double Truck Cars; how to equip them to obtain maximum efficiency under varying conditions."

"Construction, Operation and Maintenance of Roads that Operate 20 Cars or Less."

"Comparisons of the Various Systems of Electrical Distribution for Street Railways."

"Consolidation of Street Railways and its Effect upon the Public."

"The Store Room and Store Room Accounting."

"Painting, Repainting and Maintenance of Car Bodies."

#### PERSONAL MENTION.

Mr. John Rhall, chief engineer and electrician of the Union League Club, Brooklyn, N.Y., died on Friday. Mr. Rhall was a member of the National Association of Steam

Mr. Edmund F. Van Hoesen, of the class of '78 Rensse laer Polytechnic Institute, has recently been appointed chief engineer and superintendent of the Empire State Power Company of Amsterdam, N. Y.

Mr. R. M. Douglass, general superintendent of the Big Consolidated Street Railway System of Cleveland, O., has handed in his resignation, to take effect March 1.

Mr. Phillip Korst, who has been superintendent of the Badger Electric Light plant of Racine, Wis., for the past 11 years, has been appointed manager of the Janesville electric light plant, and will commence his duties at that place on

Deputy Commissioner Kerwin, of the Brooklyn Building, Lighting and Supplies Department, will inspect all electrical equipment of the Brooklyn Rapid Transit Com-

# COMMERCIAL PARAGRAPH.

## Ericsson's Swedish Desk Set.

The Ericsson Telephone Company, 296 Broadway, New York, say that their Ericsson Swedish Desk Set, illustrated herewith, gives one the luxury of telephoning. It brings



your correspondent to your elbow. It has a combined transmitter and receiver and a "cut out," which prevents office conversations being overheard through the 'phone. It is a complete instrument, with generator and bells, rings through 25,000 ohms, and is claimed to be the handsomest desk set

Send to the Ericsson Company for their latest catalogue.

#### INCORPORATIONS.

The Penn Power Company, Telluride, Col.-to furnish electrical power. Capital stock, \$100,000.

The Consolidated Electric Lamp Company, Danvers, Mass.-to conduct the business of renewing incandescent lamps. Capital stock, \$100,000.

The Electrical Development Company, Wilmington, Del.to deal in electrical and other vehicles. Capital stock, \$200,-000.

The South Jersey Water & Electric Power Company, Trenton, N. J.-to construct dams in Maurice River and Muddy run, in Cumberland and Salem counties. Capital stock, \$250,000. Incorporators: Charles K. Landis, Matilda T. Landis and Marcus Fry, all of Vineland.

The Colorado Springs Car Company, Colorado Springs, Col. —to generate electricity for power and other purposes in El Paso County, also to build electric railways. Capital stock, \$100,000. Incorporators: William P. Bonbright, William A. Otis and Leonard E. Curtis.

The Chesapeake Electric Company, Baltimore, Md.-to conduct a general electric supply, manufacturing, repair and contract business. Capital stock, \$20,000. Incorporators: Francis T. Homer and Benjamin C. Howard of Baltimore. County; Jacob I. Cohen and Allan M. Cohen, of Baltimore; Eugene Greenway, of Harford County.

#### ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A, MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all informa tion regarding the cost of United States and Foreign Patents Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City. N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon pay-

ment of ten cents. When ordering give name, date and title of invention wanted.]

#### LETTERS PATENT ISSUED FEBRUARY 20, 1900.

#### ELECTRIC RAILWAYS AND APPLIANCES.

KLECTRIC RAILWAYS AND APPLIANCES.
643,709. Electric Suburban Car. Michael Brillinger, Toronto, Can., assignor of one-half to Isaac Newton Devins, same place. Filed Aug. 31, 1899.
643,730. Electric Switch. William T. Pringle. Primos, Pa., assignor of one-half to Edwin R. Keller, Philadelphia, Pa. Filed July 19, 1899.
643,742. Conduit System for Electric Railways. Leon Dion, Boston, Mass, Filed July 2, 1897.
643,854. Electric-Motor Wheel. James T. Whittlesey, Elizabeth, N. J. Filed June 28, 1899.

ELECTRIC LIGHTS AND APPLIANCES.

643,834. Electric-Arc Lamp. Christian J. Toerring, Philadelphia, Pa. Filed July 18, 1899.

ELECTRICAL MACHINERY AND APPARATUS. 643,758. Starting-Box and Controller for Electric Motors. Frank R. Blake, Boston, Mass Filed Dec. 8, 1899.

SIGNALS AND SIGNALING APPARATUS. 643,666. Signal System for Railways. King W. Mansfield and William R. Thompson, South Norwalk, Conn. Filed April

William R. Thompson, South Notwara, Coll. 6, 1899.

823. Motor Actuated Signal Mechanism. Thaddeus B. Keeler, Rahway, N. J., assignor to the Standard Railroad Signal Company, Arlington, N. J. Filed March 10, 1899.

824. Motor Actuated Signal. Thaddeus B. Keeler, Rahway, N. J., assignor to the Standard Railroad Signal Company, Troy, N. Y. Filed May 10, 1899.

864. Automatic Return-Signaling Device for Telephones, Franz Burger, Fort Wayne, Ind., assignor of three-fourths to Henry M. Williams, same place. Filed May 3, 1899.

## TELEPHONES AND TELEPHONE APPARATUS.

643,749. Telephone Directory. Lewis H. Mertz, Los Angeles, Cal. Filed Nov. 16, 1898.
643,830. Telephone-Transmitter. Alfred Stromberg, Chicago, 111. Filed Nov. 10, 1899.
643,993. Telephone-Transmitter. Charles E. Tucker and Louis S. Jenkins, York, Pa. Filed May 23, 1899.

# MISCELLANEOUS.

MISCELLANEOUS.

643,627. Transmitting device for Horseless Carriages. John C. Blevney, Newark, N. J. Filed May 10, 1899.

643,706. Telegraphic Safety Device. Selden R. Wright, Morton, N. Y. Filed Dec. 11, 1897.

648,722. Thermostat. Charles E. May, Dunedin, New Zealand. Filed Nov. 14, 1898.

648,744. Electric Heater. Gardner C. Hawkins, Boston, Mass., assignor to George E. Smith, same place. Filed March 13, 1899.

648,840. Combined Electrical and Tubular Organ-action. William B. Fleming, Detroit, Mich. Filed June 21, 1898.

643,855. Controller for Electric Automobiles. Chas. G. Burrows, Windsor, Conn., assignor to the Eddy Electric Manufacturing Company, same place. Filed Nov. 15, 1898.

643,880. Thermostatic Apparatus. Ludwig Morgenstern, Gottingen, Germany. Filed June 21, 1899.

644,029. Process of Electrodeposition of Metals. Sherard O. Cowper-Coles, London, Eng. Filed Aug. 28, 1899.

DESIGN.

## DESIGN.

59. Casing for Dynamo-Electric Machines or Electric Motors. Norman C. Bassett, Lynn, Mass., assignor to the General Electric Company of New York, Filed Jan. 18, 1900.

# GENERAL NEWS.

# What is Going On in the Electrical World.

#### LIGHTING.

Alpha, Ill.—Alpha business men are talking of a \$10,000 electric light plant, which shall light this place. New Windsor and Woodhull.

Alton, Ill.-W. Waples has been granted a franchise to erect an electric lighting plant here.

Amesbury, Mass.—The city council is discussing the question of erecting a municipal electric light plant.

Appleton, Minn.—The village council is considering the advisability of owning its electric light plant.

Arcanum, O.—The citizens of this place have decided to call an election to vote on a proposition to issue \$15,000 in bonds to build an electric light plant

Beaver Dam, Wis.—The franchise recently granted by the city for a new electric light plant has been sold to E. D. Lawrence, J. Martin and G. R. Congdon, all of this city.

Berlin, Wis.—E. L Draffen, president of the Municipal Construction Company of Chicago, has been here looking over the city to estimate the cost of a new electric light plant to meet the requirements for both commercial and plant illumination.

Blue Rapids, Kan.—A franchise has been granted to W. Lee Hall to put in and operate an electric light plant here.

Brampton. Ont.—Brampton's electric light plant, situated at Huttonville, four miles west of this town, was destroyed by fire a short time ago.

Carthage, Ind.—The trustees are considering the question of erecting an electric light plant.

Cartersville, Ga.—The city contemplates lighting the streets by electricity. Address Geo. S. Cobb, chairman

Creston, Ia.—The Creston Water Works Company has been discussing the question of establishing and conducting an electric light plant in this city.

Durham, N. C.—The electric light plant of this place was recently destroyed by fire. Loss \$25,000.

East Liverpool, O.—C. A. Smith, one of the wealthiest men of this city, intends to build an electric lighting plant here in opposition to the East Liverpool & Wellsville Street Railway Company, who now have the contract for lighting the city.

Evanston, Ill.—The first active move toward the establishment of a \$150,000 electric lighting and heating plant in this city was made recently by representatives of a Toledo company. The plant will be equipped with machinery to furnish light and heat to 300 houses.

Griswold, Ia.—A movement has been started to erect an electric light plant here.

Horseheads, N. Y.—The board of trustees of this village is discussing the question of an electric light and waterworks system.

McGregor, Ia.—A new electric lighting plant is contemplated for this city.

Morgantown, W. Va.—A proposition has been made to the council by Hon. Geo. C. Sturgiss to light the streets of this place with electricity.

Prairie du Sac, Wis.—The electric light plant in this city, owned by J. Miser, was lately destroyed by fire.

Raleigh, N.C.—An electric light plant will be installed in the penitentiary. Address J. P. Cilley.

Statesville, N. C.—This city will enlarge its electric light plant, installing a 1,200 light alternating incandescent dynamo and power to operate it. Address D. A. Miller, chairman of electric light committee.

Still Pond, Md.—An electric light plant is soon to be

Wappinger's Falls.—N. Y.—A proposition to bond the village for \$15,000 for electric light will be placed before the taxpayers at the annual election on March

Waverly, Kan.—Mr. Warner is interested in the building of a new electric light plant here.

Wildwood, Pa.—The borough council of this place has granted a franchise for the building of an electric light plant.

Wolfe City, Tex.--The Medlin Milling Company will establish an electric light plant in this city.

Woonsocket, S. D.—Arrangements are in progress to install an electric lighting plant at this place.

# STREET RAILWAYS.

Albany, N. Y.—The State Railroad Commission has granted the application of the Albany & Hudson Railway & Power Company for approval of its plans to operate its road by the overhead electric trolley system on that portion of its proposed line which is a street surface road, and by the third rail electric system on the portion heretofore operated by steam.

Appleton, Wis.—It is proposed to extend the Appleton-Neenah interurban to Kaukauna this summer.

Columbus, O.—The Columbus & Xenia Traction Company, incorporated by J. Little, A. Wickersham,

A. G. Carpenter and A. S. Frazer, proposes to build an electric railway from this city to Xenia.

Delaware City, Del.—The work of building the new electric railway from New Castle to this city will be commenced in March and completed by the first of

El Paso, Tex.—J. T. Terry of New York and others have purchased the Santa Fe Street Railway and will change it to electric power. It is about 4 miles long. Fayetteville, N. C.—W. McNeill and others have

ecured a franchise to build an electric railway at this

Flint, Mich.—The promoters of the proposed Flint-Fenton electric read will begin construction of the line next summer. It is also their intention to extend the line through Holly, Davisburg, Clarkston and Waterford to Ponting Waterford to Pontiac.

Kansas City, Mo.—The Metropolitan Street Railway Company will soon transform its cable roads for both Kansas Cities into trolley lines and the connections and extensions which it proposes to build this year involves the expenditure of two million dollars.

Ligonier, Ind.—Capitalists are formulating plans to build an electric railroad from Ft. Wayne to this town. P. A. Randall is at the head of the enterprise.

Malott Park, Ind.—The newest project in the way of an interurban electric line is the proposed road to Mt.
Nebo. If built the road will pass through Millersville
and this place, connecting with the Indianapolis line at the fair grounds.

Milford, Del.—The Delaware General Electric Railway Company has secured the right of way for its road between here and Dover, except where it crosses the farm of Mrs. Sarah E. Shockley near Cooper's Corner.

Mt. Holly, N. J.—The Moorestown Traction Company, composed mostly of Moorestown capitalists, has been incorporated at this place for the purpose of building an electric railway from Merchantville to Moorestown and thence here.

Myerstown, Pa.—Surveyors have lately been at work viewing the bed of the old Union canal. The object of the survey is said to be the construction of a roadbed for a street railway to connect Womelsdorf and this place, the last link but one in the vast chain of electric railways uniting all that section of Eastern Pennsylvania from Harrisburg to Philadelphia.

New Hope, Pa.—It is reported that William Jenks Fell, promoter of the Doylestown and Willow Grove road, is negotiating with capitalists for the purpose of building an electric railway between here and Doylestown on the New Hope and Centerville turnpike road.

Newark, O.—Application has been made for a fran-chise for the proposed Luncaster-Newark Electric Railroad, running through Hebron, Millersport, New Salem and Pleasantville.

Oshkosh, Wis.—The Citizens' Traction Company's properties of this city have been purchased by McMillen, Emerson & Co., of New York. The company is capitalized at \$500,000. Extensions and improvements are

Petersburg, Va.—The Southside Railway Company has decided to build several miles of extension to its electric lines in the near tuture.

Rossland, B. C.-C. S. Drummond, one of the direc-Rossiand, B. C.—C. S. Drummond, one of the directors of the British Electric Traction Company has been here from London, Eng. He proposes to construct an electric railway throughout the city and on Sophie mountain, a distance of 15 miles. The project is favorably regarded by the city authorities.

Salt Lake City, Utah.—A surveying party under Chief Engineer G. A. Gibbs have been surveying for the new Valley electric line from this city to Ogden.

Sterling, Ill.—Thos. Diller and T. McMillan of this city have asked the city council for a franchise permitting them to operate an electric street railway. They propose to lay 10 miles of track including a line to Mineral Springs Park.

Watkins, N. Y.—The village trustees have granted to C. W. Hathway for New York parties a franchise for the construction of an electric railway to Burdette.

Warsaw, Ind.—J. D. Wideman, a representative of the Logansport-Kendallville Traction Company, has petitioned the council for a local franchise to maintain and operate through all the streets and alleys of the town a local electric railway.

# COMPANY MATTERS.

Bay City, Mich.—The Bay County Electric Light Company's plant in this city has been sold to Bertram & Storrs of New York; consideration \$100,000.

Birmingham, Ala.—The Consolidated Electric Light Company has let the contract for additions to its power house in this city that will practically duplicate the plant. The additional buildings and machinery will cost about \$200,000.

Buffalo, N. Y.—In anticipation of a large traffic during the Pan-American Exposition, the International Traction Company has placed orders for 150 new cars, and contemplates ordering 150 or 200 later in the season. Altogether these cars will add over \$500,000 to the equipment of the company.

Colorado Springs, Col.—The Citizens' Light, Heat & Power Company, which recently secured a franchise from the city council, is having plans drawn and is making complete preparations to begin the erection of

its plant just as soon as the franchise is ratified at the coming election. About \$225,000 is to be expended in equipment.

New York.—One of the buildings in the group which occupies the entire block from 6th to 7th avenues, 50th to 51st street, used by the Metropolitan Street Railway Company, was considerably damaged by fire last week, which started in a repair shop of the electrical division on the second floor, and it is believed to have been caused by a poorly insulated electric wire. The loss will reach \$75,000.

Rochester, N. Y.—The Rochester Gas & Electric Company has purchased the Genesee Paper Company's Mill on the Genesee River, and the plant will hereafter be used as a power station.

be used as a power station.

St. Paul, Minn.—The \$300,000, which M. D. Munn, attorney for the street railway company, says will be put into new equipment for the street railway company this summer, will cover the cost of a large number of new cars for the various lines in the city.

Trenton, N. J.—The Trenton Gas & Electric Company will spend \$250,000 on its new plant, which will serve as a model to show prospective purchasers of electrical works and will be equipped with all the latest devices for furnishing electric light and power.

Worcester, Mass.—The Worcester Traction Company is to make a large addition to its power plant on Sutton Lane. It is proposed to add another large engine to the power plant and \$25,000 will be spent for equipment to produce additional power.

#### POWER AND TRANSMISSION PLANTS,

Charlestown, W. Va.—There is a scheme on foot by the manager of the Harper's Ferry Electric Light Company to utilize the splendid water power of the Shenandoah and Potomac Rivers at that place to gen-erate electricity and furnish Charlestown, Shepherds-town, Martinsburg, Winchester and other towns of the lower valley with power to run machinery, as well as supplying electric lights.

Denver, Col.—The largest of the proposed electric Denver, Col.—The largest of the proposed electric plants is that for which a site and water rights have been obtained on the St. Vrsin, and with which it is intended to supply this city, not only for lighting and power purposes, but for the operation of tramway cars. It is claimed that fully 50 per cent. of the present cost of lighting the city and running the cars can be saved by the use of power from this source, and the scheme is being carefully looked into by local capitalists.

### AUTOMOBILES.

AUTOMOBILES.

Indianapolis, Ind.—The National Automobile & Electric Company, headed by L. S. Dow and A. C. Newby, was incorporated with a capital stock of \$250,-000. The company has bought a tract of land at the junction of the Belt & L. E. W. Reilways and will have a large structure erected and doing business of manufacturing within 90 days. Models are now being constructed and every preparation is being made for a large business. Seven different types of automobile vehicles will be made. Electricity will be the motive power.—The Parry Manufacturing Company has decided to erect its new automobile factory south of the city. D. M. Parry, president of the company, says the work of constructing the buildings will begin early in the spring. The company expects to enter heartily into the trade next year.

New York.—A display of English automobiles was made at Fifth avenue and 27th street last week, in which there were seven machines of types that are not familiar here. They included a victoria, a couple of curious 'buses, a brougham, a des-a-dos, a brake, and a chara-banc that at a pinch will seat twenty persons. The vehicles all have gasoline motors, wooden wheels and solid tires. They are heavier and bulkier than the automobiles made here, but have a thoroughly made and business like look that is impressive. The largest vehicle and all the others, excepting one which has an internal gear, are chain driven. They have all been imported by the Anglo-American Rapid Vehicle Company, of which W. W. Gibbs, of Philadelphia, is president, while Francis D. Carley, of this city, is vice-president.—The New York Electric Vehicle Company has leased the store, No. 541 Fifth Avenue, for a term of years as a salesrocom for automobiles.

Reading, Pa.—Electric omnibuses are one of the pro-

Reading, Pa.—Electric omnibuses are one of the prospective delights of life in this city. The Oceanic Automobile Company has been incorporated with the intention of operating these 'buses in Scranton, Wilkes-Barre, Bethlehem, Easton and this place. The company will manufacture these contrivances and may erect their factory here. They propose to parallel existing trolley lines with automobiles.

Woonsocket, R. I.—It is stated that a Massachusetts corporation is planning to start a line of automobiles to run through the streets of this city, the purpose of which shall be to give to the people here a direct over-land communication with Boston.

# MINES, ETC.

Frisco, Col. -One of the most important enterprises is the generation of electric power for mining that will be inaugurated during the coming season at this place, which will be built by Ault & Wiborg of Cincinnati, owners of the Excelsior mine. It will be of more than ordinary importance, as it will generate more than 3,000 horse power and will, if necessary, supply power and light to Leadville. 25 miles away, and also a Breckenridge, 15 miles distant.



# THE TELEPHONE WORLD.

#### Rival Telephone Company in Washington.

The House Committee on the District of Columbia gave a hearing last week to persons interested in the operation of a rival telephone company in Washington. The projectors of this enterprise are known under the corporate title of the Washington Telephone & Telegraph Company. It was explained, however, that the company does not propose to enter the field of telegraphy. During the hearing, Chairman Babcock, after it had been brought out that the company was incorporated under the laws of New Jersey, stated emphatically that the committee would not look with favor upon any company that was not incorporated in the District of Columbia. He said that when the company was properly incorporated the committee would consider the application for authority to operate in Washington.

A number of Maryland people were present at the hearing, including ex-Representative H. W. Rusk, George R. Webb, W. J. Haywood, Harry Carr and H. W. Webb. The local branch of the company was represented by several residents of the District, including R. H. Johnson, Frank B. Noyes and E. P. Berry.

Mr. George R. Webb said that the capital stock of the company had been fixed at \$1,500,000 and argued that the standing of independent telephone companies in this country had been elevated recently. He added that there were 2,600 independent companies, and promised a guarantee of \$100,000 that the system would be promptly installed, the rates to be charged being \$48 and \$36 a year. Mr. Webb also claimed that more subscribers had been promised for the new company than the Bell Company now has in Washington. He likewise promised that the company would give any assurance that Congress might require that it would not sell out to the Bell Company when once its 'phones had been installed.

There were several others who addressed the committee, including Mr. Thomas W. Smith, of the Telephone Subscribers' Association, and Mr. J. J. Hemphill. There was a lively controversy toward the close of the hearing between Representatives Mudd, of Maryland, and Latimer, of South Caro lina, as to the time when the bill should be taken up again. Mr. Mudd insisted that the committee had not agreed to any thing, and Mr. Latimer insisted that the committee had agreed to consider the subject to-day (Wednesday) and it is expected that the new company will offer a revised bill for the consideration of the committee.

# Bell Movement in Iowa.

A gigantic movement has been organized and is being fostered by the Bell Telephone Company of Iowa to gradually absorb all of the independent systems in the State. Authentic information is to the effect that the Bell Company has been engaged for nearly a year past buying interests in the various lines, of which there are over 200, and that they eventually intend to absorb all city and toll lines. The managers of a number of these lines have become cognizant of this and they are at work forming an alliance by which they expect to be able to fight the Bell system. The Bell Company has already obtained possession of toll lines of the Ottumwa Company, seriously crippling the plant. Over \$3,000,000 is tied up in independent lines in Iowa and it will ruin many promoters if the Bell Company is successful.

## An Independent Exchange Sold.

The Independent Telephone Exchange of Lansing, Mich., has been transferred to the Grand Rapids Citizens' Telephon Company, the leading independent company of Michigan. It is understood that the Lansing stockholders exchanged their stock in the local company for an equal amount of stock in the consolidated company.

A meeting of independent telephone companies of Eastern Illinois and Western Indiana, was held recently at Terre Haute, Ind., to form a permanent organization. Charles R. Duftin and H. A. Coit, of Terre Haute, were elected president and secretary respectively. A committee was appointed to arrange a working agreement. Dr. Lumpkins of Illinois, president of the Illinois Independent Telephone Association and vice-president of the National Independent Telephone Association, was present. Ten Illinois and nine Indiana towns were represented at the meeting.

A new independent telephone company is being formed in the South, to be called the Virginia Telephone & Telegraph Company. A bill is at I resent before the Virginia Legislature for a charter that will permit the company to lay wires each city and town without the permission of the municipal authorities. The capital stock is \$5,000,000.

The Independent Telephone Association of the Carolinas was organized at Charlotte, N. C., last week. The organiza-tion represents 3,466 independent telephones and 1,479 miles of toll lines in North and South Carolina.

#### Will Meet the Bell.

C. E. Stinson, general manager of the Rochester (N. Y.) Telephone Company has just returned from Chicago where he went to purchase telephone supplies. Mr. Stinson says the Rochester Telephone Company is much alive, and doing a He says: "We have exchanges in towns roundabout. In Western New York towns there are various independent exchanges, and we hope some day to see them all united. We are building an exchange at Niagara Falls, and soon hope to enter Lockport. In the near future we expect to be able to offer to the people telephonic connections all over the State in addition to a splendid and economical city service. The independent telephone business is to-day by far the most active branch of the electrical industry in the United States.

Capital no longer hesitates to go into the business. large number of new exchanges are being established while existing ones are being extended, and in all quarters the independent movement is gaining strength. The number of first-class paving independent exchanges throughout the country is proof of the unqualified success of the movement. The exchanges now in operation rival in quality of construction, perfection of mechanical and electrical details and efficiency of service any of the Bell plants. By the opening of spring trade Rochester will have the finest independent telephone plant in the country."

## Philadelphia Councils Want Franchises Back.

Without a dissenting vote, the council's electrical committee of Philadelphia decided to report favorably to councils six ordinances repealing ordinances granting franchises to as many telephone and telegraph companies. The companies which will lose privileges if these ordinances are passed by councils Are: Mutual Automatic, chartered July 2, 1894; Philadelphia Standard, March 31, 1896; Clay Commercial, March 15, 1884; People's, June 10, 1886; Baxter Overland, December 31, 1883, and the Drawbaugh, July 18, 1898.

It is rumored that these repealing ordinances are for the purpose of clearing the docks for rivals of the Bell Company. It is said that already at least two of the late companies chartered, one in Trenton and one in Harrisburg, are quietly at work among the councilmen. As no opposition to the repealing ordinances has been met so far, no one doubts that the measure will pass councils. Then the opportunity will be given rival companies to press their claims. The Bell Company is also very active and is carefully guarding its interests.

## Battle for Telephone Franchises.

A battle royal between telephone companies is promised for the city elections in Rock Island, Moline and Davenport, The Bell companies have a majority in the councils of Rock Island and Moline and there is a strong element of that nature in the Davenport council. Two independent companies are trying to get franchises. The manager of the Tri-City Mutual Company said there would soon be begun one of the greatest newspaper campaigns that that part of the country ever saw in city elections.

Some days ago President Nieman was authorized by the Board of City Affairs of Cincinnati to enter into a contract with the Bell Telephone Company for telephones for that city's use for five years at \$60 per year for each instrument. When the contract was sent to Mayor Tafel for his approval the opinion of the Corporation Counsel was asked, and given, to the effect that no contract could be entered into for a period exceeding one year, but that the privilege of renewal might be incorporated in the contract. The necessary amendment will be made.

Grand Rapids, Mich., is the center of a telephone fight which promises to be to a finish. The rivals are the Michigan Company, now a part of the Erie system (Bell), and the Citizens' Company of Grand Rapids. With the latter are allied the independent telephone companies of the State, and it is the avowed intention of the independent companies to either cripple the Erie (Bell) Company in Michigan or to bring it to terms.

H. K. Cole, and other Minneapolis capitalists, have purchased the Evansville (Ind.) district telegraph plant, and franchises from the local stockholders with the view of putting in an independent telephone plant. They were advised that the franchise purchased would give them the right to operate a telephone system. The franchise in question has over twenty years to run, and gives the owners the right to use telephones and magneto-'phones,

The Wolverton Telephone Company has been organized at Dowagiae, Mich., with local capital, to compete with the Central, recently sold to the Erie Company.

#### A Competitor for the Bell in Brooklyn.

Within a few days the new telephone company, which has already begun operations in Manhattan, will open headquarters in Brooklyn and wage a war of competition against the Bell Telephone System. Already its canvassers for subscribers are at work, and the officers claim that they have met with fair success. The main advantages they offer over the Bell telephone are much lower rates, quicker and better service, and the absence of some of the disagreeable features which attend the work of telephoning now.

The concern in question is the Knickerbocker Telephone Company.

Its main office is at 100 Broadway, New York. Col. W. H. Eckert, who is a veteran in the telephone business, and who, it is said, organized and perfected the Bell system in Cincinnati, twenty years ago, and was later connected with the system in New York, is the president.

We shall have our system complete throughout Brooklyn by August," said Col. Eckert. "We shall establish a longdistance as well as a local service. Unlimited service on our lines will cost \$120 a year, and that means communication with all boroughs. The rates of the present company are \$240 a year, with an extra toll for service to Staten Island, Brooklyn, and some parts of the Bronx. For residences our unlimited service will be \$60 a year, while the present company charges \$70 a year for 600 messages. There will be a proportionate reduction in long-distance-rates. One of the main features of our service will be that each customer gets a direct wire, instead of having four or more on a line as under the present system.

"Every part of our equipment will be of the best, and this fact has in some instances caused delay. In the city our system will be all underground and each cable contains 400 metallic conductors, which are sufficient for 400 subscribers. are putting in a perfected central energy system, which is a great improvement over the one now in use. Our system does away with the uncomfortable buzzing in the ear, is the result of the present system when the receiver is lifted from the hook and placed to the ear. As a rule, I have not talked about our company in comparison with the old Bell system as we are simply working on our merits and expect to furnish a complete telephone system at a reasonable

We already have a large number of subscribers, not 10,000, as has been stated, but enough to begin busines with. Our solicitors are out every day getting more names."

## Telephone Rivalry.

The anti-Bell Telephone Company of Duluth, Minn., is completing the work of placing instruments, and will have its switchboard soon. They will have 800 'phones in Duluth and 500 in Superior, in their first book, now in the printer's hands. The city council has ordered the Bell Company to remove its poles and wires from the streets before April 1, and Manager Taussig says, in reference to the order: have rights, legal rights, to remain, and propose to do so." The facts are that the company was given a franchise for a specific period, which period expired last May; that the city has refused to extend its franchise for any time at any terms; that the city has notified the company that all improvements and extensions using the public streets and made subsequent to May 1 last, are at its own risk, and that the city has now ordered it off municipal property, in accordance with a decision of the United States Supreme Court. A stiff legal battle is in prospect.

Local moneyed men of Terre Haute, Ind., have organized a new telephone company and the work of constructing a new plant will begin in a few days. The company guarantees a rate not to exceed \$30 and \$18 per year for business and residences respectively. Much of the line will be underground.

President A. G. Wheeler of the Illinois Telephone & Telegraph Company is authority for the statement that the new Chicago exchange will be in operation by October 1. Nearly all of the independent exchanges included in the Independent Association are finished.

The Northwestern Indiana Telephone Company has completed and put in operation a local exchange in Hobart. The company has a number of patrons and is adding other phones daily.

The Edinburg telephone line, which is being extended southwest of Nashville, Ind., by the farmers along the line. will, it is said, be extended to Nashville. At present there is no telephone line in the county.

The Connersville Telephone Company, Connersville, Ind., has been incorporated with a capital stock of \$25,000.



# ECTRICA SECURITIES.

ELECTRICITY.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electricity from a variety of sources The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gon., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mig., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

PASSE	NĢ	ER R	AILW	AYS.			PASSENGER RAILWAYS.						
FAME.	<b>D</b>	Capital		Rate and Date of					Capital		Bate and Date of		
7444	· arj	Luthors'd	TRANSOC.	Last Div.	RIG-	Asked.	NAME.	Par	Authorz'd	Issaed.	Last Div.	Bid.	Anke <b>4</b>
Albany, N Y. Feb 26 United Traction (Consolidation of the Albany and	100	2,000,000	\$1,750,000	) 1½ % Q., Nov. '9	8. 129	181	Hartford Conn.—Feb 26: Hartford Street By. Co Hartford & West Hartford RE	. 100 100	\$4,000,000 1,000,000		8 % 8., Oct., '98.	145	
Troy City Railway.)  Allentown Pa.—Feb 26							Holyoke Mass.—Feb 26. Holyoke Street By. Co	. 100	400,000	400,000	8 % A., June, '98.	200	2013
Allentown & Lebigh Vel Tree Oo	1	4 000 000	1 500 00			15	Hoboken, N. J.—Feb 26.						1
Bridgeport, Conn—Feb 26: Bridgeport Traction Co	100	2,000,000		1 % Aug., '98.	105		North Hudson Co. (N. J.) Ry. Co Indianapolis, Ind—Feb 26. **Citisens' Passenger Ry		1,250,000 5,000,000		8 %, 1892.	150	28
Baltimore, MdFeb 26	ļ						Lancaster, PaFeb 26	· ````	5,000,000	0,000,000		] -	
a United Railways & Elec. O ocom	. 50	24,000,000	18,000,000		163	17	Pennsylvania Traction Co	. 100	10,000,000			-	-
Boston, Mass.—Feb 26 New England Street Ry	-	5,000,000	1 067 99	1 % Q., Jan.15, '9	.		Lancaster & Col. Electric By West End Street Ballway	: :	• • • • • • • • • • • • • • • • • • • •	87,500	***************************************	==	=
North Shore Traction Cocom North Shore Traction Copfd b West End Street Ry. Cocom West End Street Ry. Cocom	100 100 50 50	4,000,000	4,000,000 2,000,000 9,085,000 6,400,000	16 % S., A. & O. 16 % S., A. & O. 18 % S., Oct., '98 14 % S., Jan. 2, '99 12 % % Aug. 98,	15 85 925	16 87 98 114	Louisville, Ky.—Feb 26 : Louisville Rycom Louisville Ry	100 100		8,500,000 2,500,000	1% %., April '98, 2% % S., Oct. 1, '98	6834	69 111
Boston Elevated B. R	. 100	10,000,000	1	21/2 % Aug. 98,	1.2	104	Minneapolis. Minn.—Feb 26	100	17,000,000	15 010 000		68%	
Brooklyn N. Y.—Eeb 26; Brooklyn City By	100	2,000,000	1.928.400	,	287	289	Twin City Rapid Transitcom Twin City Bapid Transit? % ptd		8,000,000	1,712,200	134 %, Oct., '98.	186	187
Brooklyn Rap. Transit Co., tr certf  Brooklyn Heights Railroad	100	20,000,000 200,000 12,000,000	20,000,000 200,000 12,000,000 2,000,000	8½ % Q., Jan., '9	6534		Montreal, Canada.—Feb %: Montreal Street Ry. Co Toronto Street Ry. Co	100		4,000,000 6,000,000	8 % S., M. & N. 1% % S., J. & J.	294 1023	267 1083
eBrooklyn, Queens Co. & Sub. RR. Co ney Island & Brooklyn RR. Ki ngs County Elevated	. 100	2,000,000 4,750,000	1,884.200	2½% Nov., '98.	825	::	Memphis Tenn.—Feb 26:	1					
Ki ngs County Traction Co	100	4,500,000 6,000,000	4,500,000	1 % July 26, '97	76	77	Memphis Street Railway Co	. 100	500,000	500,000	***************************************	25	-
/Atlantic Avenue Railroad	50	2,000,000	2,000,000	• • • • • • • • • • • • • • • • • • • •			New Haven, Conn Feb 26: Fair Haven & Westville RR	25	2,000,000	2,000,000	8 % S., Sept. '98.	46	
gBrooklyn, B. & W. E. Railroad Buffalo N. Y.—Feb 26:		1,000,000	1,000,000				New Haven Street Railway Co New Haven & Centerville	1 100	1,250,000	1,000,000 800,000	8 % S., Sept. '98. 2% % A., July '96.		•••
Buffalo & Niagara Falls Elec. By	100	1,250,000	1,250,000		74	75	Winchester Avenue RR	25				47	=
*Buffalo Railway Co	100	6,000,000	5,870,500	1 % Q. Dec., '98.	100	102	New Orleans, La.—Feb 26: Canal & Claiborne RR. Co	40	240.000	940.000	4 % G T-1- 100		
Columbus O.—Feb 26: Columbus Street Railroad	100	8,000,000	8,000,000	1 % Q., Feb., '99.	21	22	New Orleans & Carrollton RR	100	1,200,000		1 % S., July, '98, 1 % % Q., Oct., 98.	148%	
Columbus Street Bailroad, pfd	100	1,500,000	1,500,000	•••••	81%	82%	New Orleans Traction Co new com New Orleans Traction Co new pfd	1 100	• • • • • • • • • • • • • • • • • • • •		************	25 101	26×
Charleston, S. C.—Feb % Charleston City Ry. Co	50	100 000	100 000	8 % B.		İ	New Or City & Lake DD	100	2,000,000	2,000,000 2,000,000	8 % S., Jan., '99. 4 % S., Jan., '99. 1½ %., June, '94. 1½ %. Oct., '96.	20%	26
Enterprise City RR. Co	25	100,000 1,000,000		• 79 54		::	Orleans Railroad	1 60	500,000 1,000,000	1,000,000	1½ %., June, '94. 1½ %. Oct., '98.	56%	52 87
Chicago, Ill.—Feb 26			. <u>.</u>		1	İ	New York-Feb 26:	1					] "
Ohicago & South Side R. T. RR	100 100	12,000,000 10,828,800	12,000,000 10,828,800	8 % Q., Dec. 81, '9	3. 275	280	Central Crosstown RR cOhristopher & 10th Sts. RRguar	1 100	000,000 650,000	600,000	214 % Q.	265 170	280 180
Ohicago City Ry. Co	100	10,000,000	10,000,000	*********	1954		Dry Dock, E. Brdw'y & Battery RR dMetropolitan Street Ry. Co.		1,200,000	1,200,000	2½ % Q, 2½ Q, Oct., '98. 1½ % Q, Nov., 98. 1½ % Q, Jan., '99. ½ % A., July, '98. 2½ % Q.	125 170	150
				8 % Q., Jan., 99.	76 280	78 281			900,000	900,000	A., July, '98.	85	1703/4
North Chicago Street RR	100	500,000	249,900			••	Broadway & Seventh Aveguar gCen.Park,N.&E. Rivers RR. guar &Righth Avenue RB	100	1,800,000	1,800,000	22 2 C	280 195	240
Routh Chicago City Railway  West Chicago St. R.B. Co	100	20,000,000	18,189,000	114 % Q., Feb. 99.	110~	110%			1,000,000 750,000			1000	405 410
Whicago Passenger Ryguar.	100	2,000,000	2,000,000	5 × 8.	::	85	Ninth Avenue RRguar	100	800,000 2,000,000	800.000	*****	195 209	205 211
Cincinnati, Ohio.—Feb 26:							Second Avenue PP	100 100	8,500,000 3,500,000	600,000 1,862,000	4% % Q. 2 % Q., Jan., '99. \$1.75 p. sh. Feb, 99.	898 200	420 205
Oincinnati Inc. Plane Bycom. Oincinnati Inc. Plane Bypfd.	50	1,000,000	575,000				m42d St. Manhaty'le & St Wich A.		12,000,000 2,500,000	10,000,000 2,500,000	\$1.75 p. sh. Feb. 99.	68 75	6834 82
Cincinnati, Newport & Cov. St. Ry.	50 100	150,000 4,000,000	150,000 8,500,000	% % Feb., '99. 2% % Feb., '98.	89	89	*Union (Huckleberry) Ry	100		2,000,000	********************	190	200
Mt. Adams & Eden Park Inc. Ry.	50 50	18,000,000	14,000,000 2,200,000	% % Feb., '99. 2% % Feb., '98. 1% % Q., Jan., '98 1% % Q.,Jan., '98.	12034	121	Newark N. J.—Feb 26: Consolidated Traction Co. of N. J	100	15,000,000	15 000 000		417	40)
Cleveland, Ohio Feb 28:	1 1			_		"	North Jersey Street Railway Co. United Electric Co. of New Jersey	100	6,000,000	6,000,000	********	29	80 80
Agron, Bed. & Olev. Elec. By Oleveland City By	100 100	1,000,000	1,000,000	¾ % Jan., '98 8-5 % Jan. '99. % % Q., Oot., '98.	48	50	Pittahupo Po - Feb %.				11% % A.	27%	28
Cleveland Electric By	100	12,000,000	12,000,000	% % Q., Oct., '98.	99%	10 t 91	Allegheny Traction Co	50	500,000	500,000		54	55
Detroit, Mich.—Feb 26 Detroit Citisens' Street By	<u></u>		1 950 0				Consolidated Traction Copfd.	50 50	15,000,000 15,000,000	15,000,000 15,000,000	2 %, Jan., '96, 8 %, Nov. '98, 1 % % Nov. 7, '98, 6 % A. 8 % %, Nov. 7, '98, 2 %, July, '98, 2 %, Aug., '96, 1 %, Oct. '98, 5 % A., June 30, 98, J. & J. J. & J.	28 61	181/8 62
Pt. Wayne & Belle Isle Ry	100 100	2,000,000	1,250,000 1,200,000	******	100¾ 175		pCentral Traction Co	50 50	1,500,000 8,000.000	18,000,000	1% % Nov. 7, '98.	69%	70
Detroit Electric Railway		250,000 1,000,000	250,000 1,000,000	*********	90	100	rDuquesne Traction Co	50 50	8,000,000 2,500,000	1,900,000	6 % A. 8% %. Nov. 7 '02		
Dayton O.—Feb 26:	100	250,000	200,000		100	110	Federal St. & Pleasant Valley By Pgh., Allegheny & Man. Trac. Co.	25	1,400,000	1,400,000	2 %, July, '98,	28	2834
City Railway Co		1,500,000	1,470,600 600,000	1¥ <b>% Q</b> .	1263		Pgh., Allegheny & Man. Trac. Co Pitsourg & Birmingham Trac. Ry. Pittsburg & West End Ry. United Traction Co	25	8,000,000	8,000,000	1 %, Oct. '98.	40	4214
Oity Railway Copfd,	100												

\*Unlisted. † Ex div.
a The United Railways & Electric Company comprises in its organization the Baltimore Consol dated Railways & Electric Company comprises in its organization the Baltimore Consol dated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co of Baltimore. The pref stock of U R & E ec Co. has been issued in the form of income bonds. b Leased to B ston E evated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Brooklyn Rapid Transit Company; road operated by Brooklyn Rapid Transit Company; road operated by Brooklyn Helachts Railroad Company; road operated by Brooklyn Rapid Transit Company; road leased to Nassau Electric RR. g Owned by Kings County Traction Company; road leased to Nassau Electric RR. a Stock owned by Kings County Traction Company; road leased to Nassau Electric RR. 430 per share on outstanding capital paid as rental by lease—West Chicago St. RR. Co.; 2550 100 of stock owned by North Chicago Street Railroad Company.
d Controls by lease Chicago West Division Railway, Ohicago Passenger Railway, and West Chicago Sreet Railroad Tunnel Company.
d Engliroad Company; \$625,100 of stock owned by West Chicago Street Railroad Company; & Majority of stock owned by Chicago West Division Railway Company; 5% on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, leasee.
Cimonnati St. Railway purebased the Mt. A. & Eden Park road, assuming the bo

\*Unlisted. † Full paid. | Outstanding. † Ex-div.
a Leased to New Orleans Traction Company at 6 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
c Leased to New Orleans Traction Company at 8 % on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
c Leased to Central Orosstown Railroad at 8 % on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
c Leased to Sd3 Street Ry for 99 years; lease assigned to Metropolitan Street Railway
f Leased to Metropolitan Street Ry. at 8 % on stock until Oct 1, 1897; thereafter 9 %.
h Leased to Metropolitan Street Ry. for 99 years from Jan 1, 1896, at \$215,000 per annum.
i Leased to Met. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.
k Leased to Metropolitan Street Railway for 18 % on capital stock.
c Ontrolled by Third Avenue Railroad by nurchase.
Dividends of 13 % yearly guaranteed by Consolidated Traction Company.
o Control by lease the Alleg'ny, Cent., Ottizens' Duquesne, Fort Pitt & Pith'n Traction.
p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
s Leased to Consolidated Traction Company for 8 % on capital stock.
s Leased to Consolidated Traction Company for 7 % on capital stock.

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PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

			1		<u> </u>		11	1				- 	
		Capital		Bate and Date of			, , , , , , , , , , , , , , , , , , ,		Capital		Bate and Date of		
NAME.	Par	Authors'd	Issued.	Last Div.	E3d.	Asked.	NAME.	Par	Authorz'd	Issued.	Last Div.	BM.	Asbed
New Beoford Mass-Feb 26 Union Street Railway Co.	100	\$850,000	\$850,000	2 %, Feb. 98.	160	165	Boston, Mass.—Feb 26. American Bell Telephone Co	100	50,000,000	28,650,000	4% % Q., Jan., '99. 1 % Q., Feb. 20, '99	878	8?314
Northampton, Mass-Feb 26		800,000	998 000	4 % A Trung 100	170	178	Erie Telegraph & Telephone Co New England Telephone Co	100	10,894,600	10,804,600	1 % Q., Feb. 20, '99 \$1.50 p. sh. Feb '99.	185	186
Omaha, Neb Feb 26:	100	300,000	220,000	4 % A., June '98,	1,0	170	New York.—Feb 26. American Telegraph & Cable Co	,,,,	14,000,000		11/2/0		
Omaha Street Ry	100	5,000,000	5,000,000	8 % A. and N.	55	65	*Central & South Am. Teleg. Co *Commercial Cable Co	100 100	6,500,000	6,500,000	12 2 d.	114	117
Paterson Ry. Co	. 100	1,250,000	1,250,000	***************************************	54	_	Franklin Teleg. Co2½ % guar.   Erie Telegraph & Telephone Co	100	1,000,000	4.800.000	1	1901 42 112	60
Providence, R. IFeb 26:					100		*Gold & Stock Telg. Co., guar. 6 %. *International Ocean Tel Co., guar 6%		0,000,000	•••••	ix x d	1183	
United Traction & Electric Co Philadelphia.—Feb 26.	100	8,000.000	8,000,000	¾ %, Oc1. '98.	108	108%	Mexican Telephone Co*New York & New Jersey Tel. Co	100 100			2% % Q., Jan., '99. 2 % 8.	167	814 175
Fairmount Park Trans. Co\$50 pd. Hestonville, Man. & Fairmount	50 50	2,000,000 1,966,100	1,770,000 11,966,100	2 %, Dec. '97.	28 47	24 48	*Pacific & Atlantic Telegguar. 4 % *Postal Telegraph Cable Co *Sout'n & Atlantic Telg. Co.guar. 5 %	100	2,000,000 15,000,000	15,000,000	2 % 8.  1 % Q.	78 114	82 116
Hest'nvl'e, Man. & Fairm't6 % pfd. aFairmount Pk. & Had. Pass. Ry	50			2% %, July 15, '98, 8 % S—July, '98, 8 % Feb. 1, '98.	75 75	76 76	†Commercial Union Telegraph Co	25 25	800,000	500,000	8 % 8., Jan., '99. 1% %, Q, Jan. '99.	115	881/4
Union Traction Co \$125 pd	50	80,000,000	29,980,450 8,297,920		881/A		†Div. guar. by Postal Teleg. Co.		*****	31,810,000	1,4,74, 4,000.	107	30/1
dOitisens' Passenger Ry Frankford & Southwark Pas. R	50	800,000	11.875.000	2314 sha'e A—Apr.98	845 45 48	451	Miscellaneous Feb 26 : American Dist. Teleg. (Phila.)	25	400,000			21	84
Lehigh Avenue Ry. Co	50 25 50		1,000,000	A. & O. \$9 share A, Mar. 98	90	90¾ 	Bell Teleph. Co. (of Canada.)	100	••••		••••	188 68	65
ePeople's Traction Co	50	10,000,000	<b>16,000,000</b>	8 %, A., April, '98.	144	145	Chicago Telephone Co	100 100	750,000	750,000	••••	200 148 76	210 150 76
heople's Passenger Rycom.	50	500,000	150,000  740,000	8 % Jan., 1898.	151	152	Hudson River Telephone Co *Northwestern Telegraph Coguar	100 50	2,000,000 2,500,000		1 <b>X Q</b>	117	120 120
hPeople's Passenger Rypfd. (Philadelphia Traction Co	50	750,000 80,000,000	1277,402 120,000,000	82 p. sh., Oct. 98.	 96	 96⅓	Providence (R. I.) Teleph. Co Southern New Eng. Teleph. Co	50 100				943/4	
Ontinental Pass. Ryguar	50 50 50	1,000,000	580,000	6 % A—Mar., '98. 86 share—July, '98.	158	157	ELECTRIO LIGHT A				OAL MFQ.	. 00	
†Empire Passenger Ry. Co	50	1,000,000	475,000	\$7.50 share July '98 \$8.50 share July '98	20 <b>2</b> 100	208	Boston, MassFeb 26:						
Ridge Avenue Passenger Ry Philadelphia & Darby Ry.guar.	50	750,000	[420,000 [200,000]	812 share, July '98. 82 share July, '98.	8.83/4	809	Fort Wayne Electric trust receipts. Ft. Wayne Elec Co. T. Sec. Series A.	25	• • • • • • • • • • • • • • • • • • • •	••••	1111	115 85	123 40
17th & 19th Sts. Pass. Ry. guar Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	[250,000] [835,000]	11/4 % S., July, '98.   811 sh. A., July, '98.	800	••	deneral Electric Co. [old] com. General Electric Co. [new] "	100 100	40,000,000 18,276,000	80,460,000 18,276,000		117	iis
i West Philadelphia Pass. Rv	50 50		1900,000	89.50 shre, July '98' \$10 share, July '98	269	240	TH. Elec. CoT. Secur., Series D. Westinghouse Elec. & Mig.Co.com.	50 50	4.000,000	146,700		126 S 48	126½ 48¼
Rochester, N. YFeb 26:					1817		Westinghouse El. & Mfg. Co. pfd. Westinghouse El. & Mfg. Co. assent.		11,000,000	8,195,126	1¼ % Q., Jan., '99.	 er	68
Reading, Pa Feb 26	100	8,000,000	5,000,000	******	17%	20	New York.—Feb 26; Edison Elec. Ill'g Co., New York	100	9,188,000	7,988,000		119	120
heading Fraction CokCity Passenger Ry	50			Semi-an.,Jan. & Jy Jan., '98.	24 138	26 	*Edison Elec. Ill'g Co., Brooklyn Edison Ore Milling Co	100 100	4,000,000	2,000,000	134 % Oct., '98.	8	ij
East Reading Electric Ry	50		<b>‡1,000,000</b>	Jan., '98.	70		Electric Vehicle Oocom.   †General Electric Oo. [old]com.   General Electric Oo. [new] "	100	40,000,000	80,460,000	2 % Q., Aug., 1998.	82	93
St. Louis MoFeb 26: Fourth Street & Arsenal Ry	50		150,000				Interior Conduit & Insulation Co   Kings Co. El. L. & P. Co	100 100 100	1,000,000	1,000,000 2,500,000		126 41 110	1261/4
Jefferson Avenue Ry. Co Lindell Ry	100	2,500,000	400,000 2,400,000	2 % Dec., 1888. 1% % Jan., '99. 1% % Jan. '99.	::	••	Pittsburg, PaFeb	100	2,300,000	2,000,000	A. & U.	•	
National Railway Co		2,500,000 2,500,000 2,000,000	2,479,000 2,500,000	1% % Jan. '99.	::	••	Allegheny County Light Co  East End Electric Light Co	100 50	800,000 800,000	500,000 800,000	J. & J. Q	166	172
St. Louis RR	100	2,000,000 2,400,000	2,000,000 2,800,000	1% % Jan. '99. 4 %, Oct., '98. 21/4 %, Jan., '99. 11/2 % Jan., '99. 50c., Dec., '89.		••	Philadelphia, PaFeb 26	100					
People's RR. Co	50	500,000	500,000		25	80	Edison Electric Light Oo *Electric Storage Battery Oocom. *Electric Storage Battery Copfd.	100 100 100	2,000,000 8,500,000 5,000,000	• • • • • • • • • • • • • • • • • • • •	******	144 120 116	14434 19034 120
St. Louis & Suburban Ry	100	2,500,000	2,500,000	8 %, Jan., '99.	76¾ 68	771/2	Northern Elec. Light & Power Co Southern Elec. Light & Power Co	10	550,000 187,500	550,000 187,500	•••••	18	18%
Union Depot RRSan Francisco, Cal.—Feb.	100	4,000,000	4,000,000	8 % A., July, '95.	••	••	MiscellaneousFeb 26:	ı	1	20.,000			_
Ualifornia St. Cable RR	100	1,000,000 1,000,000		50c. monthly. 82.50 share, '96.	116 50		Bridgeport (Conn.) Elec. Lt. Co Missouri-Edison (St. Louis)com.	25	500,000	• • • • • • • • • • • • • • • • • • • •	****	47 25	43 28 15
Market Street Ry	100	18,750,000	18,750,000	Q., 60c. per share.	621/8	68 16	Hartford (Conn.) Elec. Light Co	25 100 25	850,000			10 156 6	160
Scranton Pa -Feb 26:					_		Hartford (Conn.) Lt. & Power Co New Haven (Conn.) Elec. Lt. Co Narragansett (Prov., R.I.) Elec. Co.	100	175,000 100,000 1,200,000		 2 % Q., Oot., '98.	195 98	100
m Scranton & Carbondale Trac. Co	,  100	500,000	500,000	******	29 16%		Rhode Island Elec. Protec. Co Royal Elec. Co. (Montreal)	100	1,000,000		1 Q 1	1184 189	192
m Scranton & Pittston Traction Co Springfield Ill.—Feb 26:	100	1,050,000	1,050,000	***************************************	••	••	Toronto (Canada) Elec. Light Co Thomson-Houston Welding Co	100 100	1,085,000	1.085.000	1% % Q 8 % 8, Dec. 1, 99.	185	187 100
Springfield Consolidated Ry	100	750,000	750,000	***************************************		••	Woonsocket (R. I.) Electric Coi †On Aug. 17 last by a majority vot to \$20,827,200, of which \$18,276,000 is c		the stock	holders th		105   s <u>r</u> ed	106 uoed
Springfield OFeb 26 Springfield Street By	100	1,000,000	1,000,000	*********	_	11	Recently acquired the Edison Illi	umir	on and \$2 ating Co.	,551,200 pr of Brook!	eferred. yn and its constit	Į Ex uent	com·
Springfield, MassFeb 26:	,,,	1 000 000		0.04.0		222	pany, the Municipal Electric Light		NOUS	RTDIE	· .		
Toponto Canada.—Feb 26:	100	1,200,000	1,166,700	8 % A.	207	212	Boston Mass.—Feb 26:		1000	7777	1		-
Toronto Street Ry Montreal Street Railway Co	100	6,000,000 4,000,000		1% % 8.	1023/4 294	103½ 296	Delaware Gas Light Cocom.	50 50	500,000	500,000 200,000	J. & J. J. & J.	72× 98	
Washington, D. CFeb 26:							Delaware Gas Light Copref. American Electric Heating Co Street Ry. & Illu'g Propertiespfd		10,000,000	********	2 p. sh. Jan. 26, '99	:	
Belt Ry. Co	50 100 50	112,000,000	12,000,000	65c. per sh, Oct. 97.	92	921/8	United Electric Securities Copfd.	100	••••	1,000,000	8.50 p.sh. Nov'98.		100
Columbia Ry. Co	50	707,000	652,000		85 15	40 16	New York.—Feb 26: Consolidated Electric Storage Co			••••••	••••	8	13
Metropolitan RR, Co				2⅓ % Q.	••		Safety Car Heating & Lighting Co Worthington Pump Cocom.	100 100	5,500,000	5,500,000			155
Worcester Traction Cocom	100		8,000,000		28	81	Worthington Pump Copfd Philadelphia PaFeb 26:	100	2,000,000	2,000,000	/ X A	109	110
Worcester & Suburban Street Ry	100		2,000,000 542,500	8 % 8., Feb., '98. 4% %, 1897.	105	106 85	Electro Pneumatic Trans. Co United Gas Improvement Coscrip.	10 50	1,500,000 10,000,000			1	1½ 162
Wilkesbarre & Wyoming Val. Trac	100	5.000.000	5.000.000	1% Jan '97	26	29	Welsbach Commercial Cocom. Welsbach Commercial Copfd.	100 100	8,500,000 500,000	*****		113/4 57/4	11% 57%
* Unlisted. † Paid in. † Full	naid	. I Outst	anding 3	Ex-div	-		Welsbach Light Co Welsbach Light Co., Canada	5 5	525,100 500,000	•••••	••••		45
a Leased to Hestonville, Man & b Consolidation Electric, Pec	pole	s and Ph	lladelphia	Traction compan	itea	Rived	Pittsburg, Pa.—Feb 26: Oarborundum Mig. Oo	100	200,000	200,000			
oharges and all indebtedness of a Traction Company.  c Practically all shares owned					d by	Union	Standard Underground Cable Co	196	1,000,000	1,000,000	<b>Q</b> 1	175	180
d Lease to Frankford & Southv  c Leased to Electric Traction C	vark Jonit	Passenger	Ry. assur	med by Electric Tr	actio	n Co.	Miscellaneous.—Feb 26: *Barney & Smith Car Cocom.	100		1,000,000		31	25
f Controlled by Frankford & S  a Leased to People's Passenger	uth Rai	wark Pass	per share	-			*Barney & Smith Oar Copfd. Billings & Spencer Co	100 26	*****	2,500,000		.	100
h Majority of stock owned by i Leas-d to Union Traction Cor	Peor npar	ole's Tracti	on Compa	ny.			Johns-Pratt Co	100	1,250,000		% % Feb. '94	58 96	8 15 8
j Lease transferred to Union T jj Leased to United Traction C p.a. \$20,000 in 1899-1900 and \$30.00	omr	anvat s r	ental of f	10,000 per annum	in 1	866-7-8	*Pratt & Whitney Copfd *Pratt & Whitney Copfd Stillwell-Bierce Cocom.	100	•••••	•••••		47	52 5U
declared as a dividend semi-annua	ally.	Reading Tr	ection Co	mnenw		Ī	Shill Belting Co	100	500,000			96	96 
Dividend of 6 % guaranteed l Leased and operated by the S	oy R kran	eading Tra	etion Con	npany. rmerly Scranton Tr	ractio	n Co.	St. Charles Car Co	-	********	*******	•••••	<b>**</b>	106
							•	-	•		•		



# BONDS.

PASSEN	ER R	AILWA	Y.				PASSEN	GER R	AILWA	IY.			
	Amou			Interest				Amo			Leterest		
NAME.	Authorized.	Issued.	Due	periods.	Bid.	Asked.	NAME.	Authorized.	Issued.	Due	periods.	Mentle.	Ana Sci
Albany N. Y.  Date of Quotation—Feb 26, 1900  The Albany Ry. Co Cons. mig. 5s. The Albany Ry. Co Gen. mig. 5s. Watervleit Turnpike & RR. 1st mig. 6s. Watervleit Turnpike & RR. 2d mig. 6s. Troy City Railway Co	\$500,000 750,000 850,000 150,000	850,000	1947 1919	M. & N. M. & N. M. & N.	*1173/ *1163/ *126 *128 *1161/	127½ 127	New Orleans La.  Dote of Quotation—Feb 26, 1900.  Canal & Claiborne RR	5,000,000 416,500 5,000,000 850,000 800,000 800,000	50,000 8,000,000 899,000 2,599,500 850,000 800,000	1899 1948 1908 1948 1907 1912	F. & A.	1051/4 108 112	112 118
Baltimore Md.  Date of Quotation—Feb 26, 1900  United Electric Ry. Colst mtg. g. 4s.  Baltimore City Pass. Rylst mtg. g. 5s. Baltimore Traction Colst mtg. 5s. Baltimore Trac. Co. Exten. & Imp. g. 6s. Bal. Trac. Co. No. Balto div. Ist mtg. g. 5s. Bal. Trac. Co. Coll. Trust. Ist mtg. g. 5s. Baltimore Traction Co. Convertible 5s. Central Pass. Ry. Colst mtg. 6s. Central Pass. Ry. OoCons. mtg. g. 5s. City & Suburban Rylst mtg. g. 5s. Lake Roland Elev.,lst mtg. 5s.	88,000,000 14,000,000 2,000,000 1,500,000 1,250,000 750,000 96,000 96,000 8,000,000 1,000,000	1,500,000 1,250,000 1,750,000  117,000	1949 1911 1929 1901 1942 1900 1906 1912 1982 1922	J. & D. M. & N. M. & N. M. & S. J. & D. J. & J. N. & M. J. & J. M. & N. J. & D.	102 74% 118% 119 104% 121 101 102% 119 116 117	102¼ 95 120  121¼  121 117	New York.  Date of Quotation—Feb 26, 1900.  Atlantic Ave. (Brooklyn)Imp. g. 58 Atlantic Av. (Brooklyn)st gen. mtg. 58 thatlantic Av. (Brooklyn)st gen. mtg. 58 thatlantic Av. (Brooklyn)Cons. mtg. 58 Broadway & 7th Ave2d mtg. 58 Broadway & 7th Ave2d mtg. 58 Broadway & 7th Ave2d mtg. 58 Broadway Surface2d mtg. 58 Broadway Surface	759,000 8,000,000 12,500,000 1,500,000 500,000 1,125,000 1,000,000 6,000,000 2,000,000 1,000,000 250,000 8,500,000	1,966,000 7,650,000 1,500,000 500,000 1,125,000 1,000,000 6,000,000 2,000,000 448,000	1909 1981 1948 1904 1914 1924 1905 1941 1939 1988 1941 1941	M. & S. A. & O. J. & D. J. & D. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J.	95 107½ 115 128 104 108 115 105 116 115 101 104 112 107	110 116 125 105 110 117 106 117 116
## All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.  BOSTON, MASS.  Date of Quotation—Feb 26, 1900, †Lynn & Boston RRlst mig. g. bs. West End Street RyDeben. g. 5s. †81,674,000 in escrow to retire outstanding bonds of absorbed companies.  Chapleston S. C.  Date of Quotation—Feb 26, 1900.	5,879,000 8,000,000 2,000,000	8,702,000 8,000,000 2,000,000	1902	J. & D. M. & N. M. & S.	114 104% 112	115 106	Brooklyn Rapid Transit gold 5s Bleecker St. & Fult'n Fer'y RR. Ist mtg. 7s Cent P'k, N. & E. R. RR. Ist cons. mtg. 7s Central Orosstown RR Ist mtg. 5s Coney Island & Brooklyn RR. Ist mtg. 5. Dry Dock, E. Bd'y & Bat'y R. g. gen. mtg. g. 5. Dry Dock, E. Bd'y & Bat'y RR. serip 5 % Eighth Av. RR. Co Oert. indebt. 6 % 42d St., Man. & St. Nich. Av. Ist mtg. 6s 42d St., Man. & St. N. Av. 2d mtg. inc. 6s 42d St., Man. & St. N. Av. 2d mtg. inc. 6s 42d St., Man. & St. N. Gen. cons. mtg. 5s Second Avenue Ry Gen. cons. mtg. 5s Second Avenue Ry Deb. 5s Steinway Ry. (L. I.) Ist mtg. 5s Steinway Ry. (L. I.) Ist mtg. 5s Third Avenue RR Ist mtg. 5s Third Avenue RR Ist mtg. 5s	. 7,000.000 . 700.000 . 1,200,000 . 250,000 . 250,000 . 1,000,000 . 100,000 . 200,000 . 1,500,000 . 1,500,000 . 1,500,000 . 1,500,000 . 1,500,000 . 1,500,000 . 1,500,000 . 1,500,000 . 1,500,000 . 1,500,000 . 1,500,000 . 1,500,000 . 1,500,000 . 1,500,000 . 1,500,000 . 1,500,000 . 1,500,000 . 1,500,000	5,181,000 700,000 1,200,000 250,000 800,000 980,000 1,100,000 1,200,000 1,500,000 5,000,000 1,500,000 1,500,000	1945 1900 1902 1922 1908 1982 1914 1914 1915 1998 1997 1909 1909 1922 1919	J. & D. M. & N. J. & J. J. & D. F. & A. F. & A. F. & A. M. & S. J. & J. M. & S. J. & J. J. & J.	109 ½ 101 ½ 107 125 101 117 102 108 116 ½ 89 124 120 120 120 118 ½ 116 110 ½	108 109 108 120 105 117 125 121 109 117 112 128
Enterprise Street RR	850,000	47,000		J. & J.	106		Twenty-third Street Rylst mig. 6.8 Twenty-third Street RyDeb. 5 Union (Huckleberry) Rylst mig. 58			1909 1906	J. & J. J. & J.	106 118	100
Chicago III.  Date of Quotation—Feb 26, 1900.  Chicago City Ry	400,000 1,000,000 7,500,000 1,500,000 1,500,000 15,000,000 8,171,000 500,000 2,500,000 2,700,000 2,700,000 12,500,000 12,500,000	600,000 7,500,000 4,040,000 8,781,200 15,000,000 500,000 500,000 2,500,000 8,969,000 6,000,000	1908 1929 1929 1907 1982 1928 1942 1906 1911 1900 1927 1928 1911	F. & A. J. & D. A. & O. J. & J. J. & J. J. & J. J. & J. J. & J. M. & N. M. & N. J. & D.	1013/4  108/ <sub>4</sub>  96 106  108  101 1065/ <sub>8</sub>	2½ 102  109  96%  111 102 107	#81,085,000 in escrow to retire gen. mig bonds.  184,850,000 in escrow to retire maturing obligations.  18562,000 in escrow to retire lst and 20 mig. bonds.  2 In treasury, \$80,000.  17 Guar. by Union By. Co.  TOPONTO Canada.  Date of Quotation—Feb 26, 1900.  Montreal St. Ry	2,500,000	800,000 2,200,000	1948 1908 1921	M. & S. M & S.	:	****
iFunded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Do., lessee. 18ubject to call after Oct. 1, 1899, at 110 and interest. 1Assumed by W. Chi. RR. Co., lessee iInt. guar. by W. Chi. RR. Co. St. RR. Co. Cincinnati, O. Date of Quotation—Feb 26, 1900. Din. New. & Cov.St. Ry. 1st Con.mtg. g.50 Mt. Adams & Eden P'k Inlst mtg. 6s Mt. Adams & Eden P'k Inlst mtg. 6s Mt. Adams & Eden P'k Inlst mtg. 6s Mt. Adams & Eden P'k Inc. Cons.mtg. 56 Mt. Adams & Eden P'k Inc. Cons.mtg. 58 Mt. Adams & Eden P'k In	8 8,000,000 46,000 100,000 5 581,090	100,000 581,000 250,000	1900 1900 1900	J. & J. A. & O. A. & O. M. & S. M. & S. J. & J.	118 % 108 % 114 108 3 % 12 1 % 182 3 %	1141% 104  1221% 187	Continental Pass. By	8 800,000 8 100,000 1 150,000 1 50,000 1 1,125,000 200,000 1 1,125,000 1 0,000 1 1,125,000 1 0,000 1	250,000	1901 1905 1911 1912 1948 1910 1917 1908 1911 1945 1905	J. & J. J. & J. M. & S. J. & . F. & . A. & O. A. & O.		
† Assumed by the Cincin. St. Ry. Co. [\$250,000 reserved to retire 1st mig. bds Cleveland, O. Date of Quotation— Feb 26, 1900 aBrooklyn Street RR. Co 1st mig. 5s Cin. New't & Cov. St. Ry. Cons. mig. 5s Cleveland City Cable Ry 1st mig. 5s Columbus (O.) Cent. Ry 1st mig. 5. So Columbus (O.) Cent. Ry 1st mig. 5. 5s The Cleveland RR 1st mig. 5. 5s The Columbus (O.) Cent. Ry 1st mig. 5. 5s The Cleveland RR 1st mig. 5. 5s The Columbus (O.) Cent. Ry 1st mig. 5. 5s The Columbus (O.) Cent. Ry 1st mig. 5. 5s The Columbus (O.) Cent. Ry 1st mig. 5. 5s The Columbus (O.) Cent. Ry 1st mig. 5s The Columbus (O.) Cent. Repids 1st mig. 5s The Columbus (O.) Cent. Repids 1st mig. 5s The Columbus (O.) Cent. Repids 1st mig. 5s The Columbus (O.) Cent. Repids 1st mig. 5s The Columbus (O.) Cent. Repids 1st mig. 5s The Columbus (O.) Cent. Repids 1st mig. 5s The Columbus (O.) Cent. Repids 1st mig. 5s The Columbus (O.) Cent. Repids 1st mig. 5s The Columbus (O.) Cent. Repids 1st mig. 5s The Columbus (O.) Cent. Ry 1st mig.	- 600,000 - 8,000,000 - 2,000,000 - 1,500,000 - 1,000,000 - 600,000 - 200,000	500,000 2,500,000 2,000,000 1,249,000 1,500,000 1,000,000	1908 1922 1909 1918 1918	M. & S. J. & J. J. & J.	1061/4 1181/4 1051/4 106	107 114½ 106 107 	People's Traction lines purchased.  Pittsburg, Pa.  Date of Quotation—Feb 6 1900.  Birmingham, Knox & Allentown	500,000 875,000 1,250,000 1,250,000 1,250,000 1,250,000 250,000 250,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000	500,060 875,000 1,250,000 1,500,000 1,250,000 750,000 250,000 750,000 1,500,000 1,400,000 2,000,000	1980 1927 1980 1918 1942 1928 1924 1927 1929 1922 1980 1984	J. & D.	110	11 108
Detroit, Mich.  Date of Quotation—Feb 26, 1900  Detroit Citizens' 8t. Ry	1.800,000	8,885,000 877,000 1,800,000	1902	A. & O.	105	103%	Providence R. I.	500,000	500,000	1918	V.&S.	116	11
New Haven Conn. Date of Quotation—Feb 26, 1:00 New Haven St. Ry Ist mig. g. 5s. New Haven (Edgewood Div.) Ist. mig. 5s. Winohester Avenue RR—let mig. g. 5s. Winhester Avenue RR Deben. g. 5s.	250,000	600,000 250,000 500,000 24,000	1914 1912	J& D M& N	111 111 109		Date of Quotation—Feb 26, 1900, Baden & St. Louis RR1st mtg. 5s Cass Ave. & Fair Gds Ry1st mtg. 5s Citizens' Raliway Co1st mtg. 5s, Comp. Hts. Un. De. & Mer. Ter_1st	1.600.000	250,000 1,600,000 1,500,000 000 000	1912 1907	J & J	100 109 117	30 10 10 11

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PASSENGER RAILWAY.												
	Amer											
HAMP.	Authorized.	Issued.	Due	Interest periods.	BM.	Asked.						
St. Louis.					ĺ							
'Date of Quotation—Feb 26, 1100	400,000	400,000	1906	M. & N.	108	106						
Jefferson Avenue Rylst mtg. 5s. Lindell By. Colst mtg. 5s Missouri RB. Co		1,500,000	1911	F. & A. M. & S.	108 105	109 106						
tMound City BB. Colst mag. 6s. People's RB. Colst mag. 6s.	125,000		1902		100	102						
People's RB. Co	10,000	800,000	1902 1904	J. & J.								
61. Louis RR. Co	75,000 2,000,000 2,000,000	2,000,000	1905 1900 1921	M. & N.	100   993   108	101 100 %						
181. Louis & Sub. ByIst mig. g. 5s. St. Louis & Sub. ByIncome 5s. ††Southern Electric ByCons. mig. 6s.	800,000 500,000	800,000 500,000	l		80 106	84 108						
Taylor Avenue St. Bylst mtg. g. 6s. Union Depot BB. Colst cons. mtg. 6s.	500,000 1,091,000	500,000 1,091,000	1918 1900	J. & J. A. & O.	116 100	118 100%						
Union Depot RB, CoCons. mig. 6s. †Controlled by St. Louis RB. Co.	8,500,000	1,787,000	1918	J. & J.	191	122						
Controlled by Union Depot RR. Co.	<u> </u>											
[\$200,000 in escrow to retire 1st & 2d												
mig. \$500,000 in escrow. †\$200,000 in escrow to retire 1st mtg. bds. San Francisco Cal.		İ										
San Francisco Cal.  Date of Quotation—Feb., 1900.	]	ļ	}									
California St. Cable RRlst mtg. g. 5s.	1 000,000	900,000 650,000	1915 1914	J. & J. M. & S.	114	11 <b>7</b> 11 <b>7</b>						
Market St., Cable By. Colst mtg. g. 6s.	8,000,000	671,000	1921 1918	A. & O.	12634	95						
tOmpibus Cable Co1st mtg. 6s.	200,000 2,000,000 850,000		1918 191 <b>2</b>		126% 105%	107						
Park & Cliff House BBlst mtg. 6s. Park & Ocean BBlst mtg. 6s. Powell St. Bylst mtg. 6s.	250,000 700,000	250 000	1914 1912	J. & J.	115	125						
Sutter St. Ry. Colst mtg. g. 5s. †Controlled by Market St. Ry. Co.		900,000	1918	M. & N.	••••	*****						
Washington D. C. Date of Quotation—Feb 26, 1900												
Belt By Co	500,000 500,000	450,000 500,000	1920 1914	J. & J. A. & O.	182	••••						
Metropolitan BR. CoColl tr. cons. 6s.	200,000 500,000	200,000 500,000	1911 1 <b>90</b> 1	J. & D.		•••••						
†\$50,000 in escrow to retire 1st mtg.bds. Miscellaneous.												
Dute of Quotation-Feb 26, 1900.	2,000,000	1,688,000	1928	J, & J.	108	110						
Bridgeport Traction Colst mtg. 5s. Buffalo (N. Y.) Ry. CoCons. mtg. 5s. t. 'tizens' St. R. (Ind'polis).lst cons.m.5s	5,000,000 1,000,000	8,548,000 8,000,000	1981	F. & A. M. & N.	118 104	105						
Consolidated Traction (N. J.)lst mag.54 Consolidated Traction (N. J.)lst mag.54 Consolidated Traction (N. J.)lst mag.54	ിരസിക്കപ	2,866,000 2,261,000	1982 1982	M. & N. J. & J.	112 115	118						
Crosst'n St. Ry. (Colu's, O.)181 Dive y.ne	3,770,000	18,965,000 572,000	1988	J. & D. J. & D.	1111/4	111% 11 <b>5</b> %						
Denver City Cable Ry	4,0/0,000 4,0/0,000 5,000,000	\$,800,000 922,000 4,981,000	1938	J. & J. A. & O. J. & J.	20 80 119	85 1195						
Minneapolis St. Ry. 1st cons. nit? 1. 54 No. Hudson Co. Ry. (N. J.). Cons. 1146 5	5,060,000 8,000,000	1,050,000 2,378,000	1919	J. & J. J. & J.	110¼ 108	110%						
No. Hudson Co. Ry. (N.J.)2d Mtg 5r No. Hudson Co. Ry. (N. J.)Deb. 68	550,000 500,000	550,000 489,000	1928 1902	M. & N. F. & A.	••••	•••••						
Paterson (N. J.) ByCons. mtg g. 6s. Mochester (N. Y.) Bylst mtg. 5s.	1,250,000 8,000,000	1,000,000 2,000,000 4,298,000	1980	J. & D. A. & O.		100						
84. Paul City Ry	1 1	1,000,000	1900	•••••	1051/ 108	106						
†\$1,000,000 in eserow to retire 1st and d mtg. bds.	1											
1\$300,000 in treasury. Bonds guar. by Buffalo By. Co. 1\$760,000 in escrow to retire bonds of												
O. St. ER. Co.						١,						
18960,000 res'ved to redeem prior liens.					*Wish							
ELEOTRIO LIGHT AN	D ELE	OTRIC	A	. MF		08,						
Boston, Mass	1	1										
Dote of Quotation—Feb 26 1900.  Delaware Gas Lt. Co.,lst m. 5s, g.	800,000	800,000	ļ	J. & J.	106	•••••						
Edison Electric Co., Boston General Electric Co., gold coup, deb. 58	2,026,000 10,000,000	8,750,000	1922	Quar.	157 116	****						
Pittsburg Pa  Date of Quotation - Feb 26, 1900												
Allegheny County Light Co 6s. Westinghouse Elec. & Mfg. Co.Scrip 6s.	500,0 <b>00</b> 195,5 <b>70</b>	•••••	1911	J. & J. M. & S.	110	*****						
Miscellaneous.—(Feb 26, 1900.)	4,812,000	4,812,000	1910		109							
Edison El. Illg. Co. (N. York) 1st m. 5s Edison El. Illg. Co. (N. Y.) con. m. g. 5s. Edison Elec. Illg. Co. (Brooklyn)	15,000,000 5,000,000	2,188,000 5,000,000	1998 1940		124 1221	124						
Edison Electric Light (Philadelphia) Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,000,000 2,500,000	2,500,000	1987	A. & O. A & O.	109 120	105 122						
Kings Co. El. Lt. & Po. Co. pur. money 6s Milwaukee El. Ry & Lt. Co. lst con. g. 5s. United Elec. Light & Power Co(N. Y.)	5,176,000 8,000,000 5,000,000	5,176,000 6,108,000	1997	F. & A.	102	••••						
TELEPHONE		TELEG										
Miscellaneous.					100	***						
Date of Quotation—Feb 26, 1900, American Bell Telephone			1908	F. & A.	100%	101						
Northwestern Telegraph Cos. N.Y. & N.J. Telep & Telg Co. gen.mtg.5e Chesapeake & Potomac Teleph. Co5s.	******	,,,,,,	1911	J. & D.	114 108	115 106						
ALLIED	INDU			1								
Miscellaneous.		<u> </u>	Ī	1								
Date of Quotation—Feb 26, 1800.  American Electric Heating	. 500,000	\$00.000	<b> </b>			•••						
Barney & Smith Car Co68.	*********	••••••	1942 1904		106	25 107						
United Nomina	1 75,000 i			1	<u> </u>	ļ <del></del>						

# NOTES FOR INVESTORS.

Late quotations for copper are : Electrolytic, 152@16c.; Lake, 16@162c.; casting, 152@152c.

Reports from Brooklyn say there is no likelihood of a dividend on the stock of the Kings County Electric Light Company until July.

As indicative of the largely increased buying of bonds it is said that \$500,000 of the New York Heat, Light & Power Company's 5s were recently bought by a proment insurance company for 110½.

The latest quotations for some of the new industrial stocks, not given elsewhere are: Electric Boat, 17@20; New York Electric Vehicle Transportation, 8½@9; New England Transportation, 6@6½.

At the annual meeting of the Canadian General Electric Company of Toronto the stockholders sanctioned the issue of \$300,000 in new stock, available to the stockholders at 125, at the rate of one new share to three old shares.

At a meeting of the directors of the Royal Electric Company of Montreal, held a few days ago, a quarterly dividend of two per cent. was declared. The same is payable on April 1st next to shareholders of record of February 28.

The New York State Railroad Commission has authorized the Rome City Street Railroad Company to issue a mortgage of \$2,000,000 on its property and franchises. The money is to be used for the improvement of the company's road and equipment.

The sale of the Bay County Electric Light Company's plant in Bay City, Mich., to Bertram & Storrs, bankers of New York, has been consummated. Consideration, \$100,000. The purchasers represent the syndicate which acquired the Bay City gas works one year ago.

The Board of Railroad Commissioners of Massachusetts has issued an order authorizing the West Roxbury and Roslindale Street Railway to issue \$262,500 of capital stock in addition to the present \$200,000, for the purpose of paying and refunding the floating debt.

It is recorted in Wall Street that prominent interests which were caught in Brooklyn Rapid Transit last fall have been evening up old scores in the Third Avenue fight. These interests have as a rule been arrayed on the bull side of the market, but it is known that they reversed their position temporarily during the past week. It is said that their opposition to the schemes of a speculative clique cost the latter about \$1,850,000.

N. W. Harrison & Co., bankers of Chicago, have purchased the first mortgage 5 per cent. gold bonds issued by the Indiana Interurban Electric Railway Company now building a line between Elkhart and Goshen. They are bringing them out at 102 and interest. The South Bond and Goshen franchises are unlimited and the ene at Elkhart runs to 1936. The total trackage is forty two miles. The combined population of the territory is 70,000.

Counsel A. B. Boardman, of the New York Rapid Transit Commission, predicts that the Metropolitan Screet Railway Company will operate the underground road. "I don't think I am violating any confidence when I say the Metropolitan Street Railway Company is the natural operating company for this new road. The company's lateral lines make it more valuable to it than anybody else and the laws of gravitation will land the road in the hands of the one naturally fitted to handle it—the Metropolitan Street Railway Company."

Stockholders of the United Railways & Electric Company of Baltimore, at their annual meeting, re-elected the directors as follows: Nelson Perin, Col. Walter S. Franklin, Alexander Brown. George C. Jenkins, Col. Seymour Mandlebaum, Henry A. Parr, E. L. Bartlett, William P. Harvey and George R. Webb. A statement given out by the company for the nine months ended December 31, 1899, shows: Gross earnings. \$3 402,200; operating expenses, including insurance, taxes, interest, etc., \$3,359 863; net earnings, \$42,337.

By the recent failure of the Armstrong & Bolton Company, which had the contract for supplying steam heating and electric light plants for the new City Prison on the site of the old Tombs. New York, the United States Fidelity and Guaranty Company is expected to lose nearly \$75,000. The Armstrong & Bolton Company's contract was for \$93 350. Since the company's failure the surety company, which guaranteed the contract to the amount of \$75,000, has authorized the architects of the prison to advertise for bids to complete the contract. Steam heating and electrical supplies have risen in price to such an extent that the bidders for the contract are unwilling to undertake it at less than \$160,000.

The Albany and Hudson Railway and Power Company. a consolidation of Hudson Street Railway, Hudson Light a Power Company, Kinderhook & Hudson Railroad, Greenbush & Nassau Electric, Citizens' Electric Light and Power of Hudson and Kinderhook Power and Light Company, is to build an electric line between Hudson and Albany, to be operated by the third-rail system; the new company, it is reported, will build a 10 mile connecting link between Niverville and Albany and also a new steel bridge at Rensselaer, 1,900 feet, long to cross the the New York Central and Boston & Albany railroads. It will also supply light and power along its route. The conversion of the entire system to the third-rail electric is now being made.

Third Avenue Railroad stock is just now the plaything in Wall Street. As we go to press (Tuesday afternoon) the stock is without friends in the Street and is quoted at 68—a drop of 8 points for the day. A scheme to induce John C. Crimmins, a "Whitney syndicate man," is now being considered by the stock holders. A representative of the syndicate made the following statement. "It is untrue that the amount needed to finance the Third Avenue Railroad Company is anything like \$50,000,000, as has been reported. The amount of the company's unfunded debt is \$23,000,000 If that sum is raised it will save the road from a receivership. There will have to be injected into the road though a large amount of money which will have to be raised by the stockholders, as it will take \$8,000,000 to put the company's system into complete running condition, this amount being entirely distinct from the money required to meet the company's unfunded debt, which the bankers' syndicate will arrange to advance if it undertakes the financing of the debt." It was intimated that the representatives of the company's stockholders would have to show that they could raise the \$8,000,000 before the syndicate would undertake to finance the company's big debt. The representative of the syndicate said that there had been an ultimatum delivered under which the company has until this morning to raise the guarantee fund of \$8,000,000. John E. Parsons has resigned as a director of the Third Avenue Railroad Company. He was one of its oldest directors, and originally became a director through having acted as counsel of the company. Mr. Parsons made a statement Mouday in explanation of his resignation. He said that he had urged first that in order to obtain the money needed there should be an issue of stock and later that the proposed arrangement with Kuhn, Loeb & Co. should be made and that both courses having failed it seemed to him right that the new interests that had entered the company, which interests were represented by W. H. Curtiss, should have th





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# EDITORIAL NOTES.

The Cook **Elevated Electric** 

It is an apt saving that "Necessity is the mother of invention," and conse-Railway System. quently invention being the outgrowth of necessity,

it so happens that in various parts of the world peculiar types of electric railways have been built owing to peculiar or unusual topographical conditions. As an example, between Elberfeld and Barmen, in Germany, there is an aerial electric railway, the route of which lies directly over the bed of a river, the track being upheld by means of inclined girders placed at intervals in either bank of the stream. Th method of construction was found necessary owing to the difficulty of obtaining rights of way, as well as to the fact that objections were urged against the obstruction of the river to navigation.

In England a single rail electric railway, the invention of Mr. Behr, will, in all probability, be built in the near future between Liverpool and Manchester, with a view to obtaining a speed of ninety miles an hour, while in this country preliminary steps are now being taken, looking to the construction of an elevated electric railway between Milwaukee and Chicago,

This elevated road, the invention of Mr. L. F. Cook, differs materially from the elevated railways to be met with in Chicago and this city, in that the plan of construction contemplates a steel column with a truss on either side and a boxed girder upon which there is a trough track on which the wheel that holds the car in suspension runs. In other words, this system resembles in some respects the German road already referred to, as well as the invention of Mr. Behr, yet it differs entirely from them.

The Cook system was given a thorough trial in Tacoma, Wash., a few years ago, and proved, so it is claimed, a success. Some 800 feet of track was built elliptical in form with curves of seventy feet radius, and with grades ranging from 5 to 10 per cent. With a car driven by a fifteen horse-power motor, fifteen people were carried at the rate of forty-five miles an hour. One advantage of this system is that snow storms can not interfere with the operation of the cars, as is frequently the case with surface lines, but on the other hand as the cars are quite narrow, there would scarcely seem an abundance of room for passengers, which would

likely necessitate a large number of cars being

A company has been organized with a capital of \$50,000 to construct one mile of road in Milwaukee, which if satisfactory will be ultimately extended to Chicago. The principal advantage of such a road would lie in the fact that a much higher rate of speed could be attained than is now possible with the steam surface line. Under ordinary conditions, a car could travel at the rate of sixty miles an hour, but after the line is completed and the details perfected an even greater speed is hoped for by the inventor.

\*

As anyone who studies A Trade the progress of nations Worth Securing. can easily perceive, the producing capacity of the

United States has now reached a stage which far exceeds the consumption, and the ratio of excess is assuming greater proportions year by year. It is therefore imperative for the manufacturers of this country to look beyond its borders for markets wherein they can profitably dispose of their goods. Our geographical position points out the vast Empire of China and the continent of Asia, with its yet undeveloped trade, as pre-eminently ours. The rapid growth of United States trade with China, coupled with recent developments in that part of the world, seems to warrant the presentation of some facts bearing upon present commercial conditions in that vast territory. Comprising as it does one-twelfth of the land area and nearly one-fourth of the population of the globe, it is not surprising that events which indicate a marked change in its business condition or the methods of its people should attract widespread attention.

With reference to the electrical trade of this country with China, the official statistics show that the exports of electrical machinery increased from \$1,868 in 1898 to \$17,548 in 1899, while those of telegraph, telephone and other electrical instruments and apparatus increased from \$31,199 to \$34,135. These figures would seem to indicate the practicability of greatly extending the sale of American electrical apparatus in China. Manufacturing in that country is likely to assume an important position and aspect in the near future. The treaty of Shimoneseki, which followed the war between China and Japan, permitted the introduction of foreign machinery for manufacturing purposes, and gave to the Japanese many rights

as manufacturers which did not formerly exist, but which under the "favored nation" clause of other treaties were thus granted to representatives of all nations having treaties with China. The result of this has been a rapid enlargement of the manufacturing industries of China, the introduction of modern machinery, electric railways, electric lights, telephones, and many other features tending to quicken enterprise and develop manufacturing. This development is as yet very small with the population of that vast empire and with its demands, but that it is the seed which may prove the beginning of elaborate industries is evident, and electrical manufacturers will do well to thoroughly cultivate so promising a market.

To be successful in China our manufacturers must have a fuller knowledge of its requirements and be in close touch with its people. The attention of our manufacturers cannot be too urgently called to the importance of studying the requirements of the market for which their goods are intended, and of closely following minute details, which greatly accounts for the success of our European competitors. An important matter is that of trade-marks, for the Chinese lay great store or worth on brands, In short, if we intend to secure our share of China's trade, it is of vital importance that we should at all times be prepared to cater to it.

The question has often been propounded as to which is the best means of bringing American manufactures before the notice of the the Chinese. There is no better medium than that so successfully adopted by our European competitors, viz., through the intermediary of the great commercial houses long established in China, many of which are bending their energies to extend their American business, but find comparatively little support from manufacturers in this country.

\* \* \*

# Can the Waves of the Ocean be Harnessed?

For several years now or since electrical machinery has reached a high state of development in-

ventors all the world over have been endeavoring to perfect some type of apparatus for utilizing the power of the tides or the force constantly exerted by the waves of the ocean. From time to time in these columns we have referred to the progress that has been made along these lines and have described some of the experiments made with the Wright wave motor, the Bunnell wave motor, the Rider motor and others. All of these devices were designed to utilize the lifting power of the waves, but now we hear of another device invented by Mr. Stephen H. Emmens and designed on an entirely different principle. The general character of the arrangement is described by the inventor as follows:

"The idea is not a new one, by any means. I have had it in mind a good many years, and I do not claim that it originated with me. It first occurred to me some thirty years or more ago when I was visiting Kilalea, on the west coast of Ireland. At that point the Atlantic billows have worn a funnel shaped opening into the rocks. This opening, growing narrower as it penetrated further and further into the rock, concentrated the power of the waves until at length they broke an opening upward to the surface of the rocks above. Now, when the sea is heavy the waves rush in there with

such power that a column of water and spray is thrown nearly a hundred feet into the air.

"Looking at this spectacle, it occurred to me that here was a magnificent natural power, and in a form to be easily available. I did not give the matter any particular attention at the time, and, although I retained an interest in the subject, I was too much occupied with other matters to take it up with any thoroughness. Recently, when I became interested in the development of liquid air, my mind again reverted to the project of utilizing wave force, because I saw that it afforded a cheap and desirable means of manufacturing such power as liquid or compressed air. As a result I have worked out my present plan.

"Briefly it is this: After a desirable site has been selected, a channel will be constructed leading back from the water front. Following nature's suggestion, this channel will be funnel shaped, with retaining walls that approach each other as they lead back from the shore. Thus the power of the waves as they enter the aperture will be concentrated as they advance, and at the point where it is to be applied we get the same amount of power within a smaller compass.

"For example, suppose the channel at the sea end to be fifty feet wide. I have estimated that, with waves of very moderate force, there will be two horse power per lineal foot front of wave. In other words, our fifty foot opening gives us a hundred horse power. The retaining walls narrow the channel down to a diameter of, say, ten feet at the point where the water enters the race from which it is to be applied. Here we have the same horse power with a smaller frontage. With the figures I have used in illustration it would be ten horse power per foot."

To erect suitable plants and on the strength of a series of tests made at Asbury Park, N. J., on a comparatively small scale, a company has recently been formed with a capital of \$1,000,000 and known as the Wave Power Company. The principal assets of the concern are Mr. Emmens' patents, but in order to demonstrate the practicability of the invention a good size plant will be constructed—probably the coming summer—either at Monmouth Beach or Far Rockaway.

As is well known the great drawback to the majority of wave motors heretofore brought out, has been the difficulty of devising suitable means for regulating them or for causing them to generate power uniformly and evenly and not spasmodically. That Mr. Emmens appreciates this is evident, for in referring to the fact that wave power is not constant, he says:

"This fact may limit the usefulness of wave power for certain purposes. On the other hand, the use of the waves is particularly applicable to the production of power in forms that can be stored, and such forms are coming more and more into use. For that matter the surplus energy accumulated during times of storm or high waves may be stored either in the form of water or as manufactured power for uses during periods of calm. I expect that the plan will bring about not an industrial revolution, but an important addition to our methods of developing cheap power for commercial use."

There is scarcely any doubt but what the day is not far distant when it will be possible to harness the ocean in the same way that waterfalls were brought into commercial use, and on that account practical tests of devices for accomplishing this purpose will unquestionably be watched with interest.

# UNDER THE SEARCHLIGHT.

### Notes and Comments on Various Topics.

INVENTORS are now said to be at work designing fenders for automobiles. Just why automobiles should be provided with fenders when spirited horses have no net scoop in front of them is difficult to see.

AT a recent meeting in London of the Marconi Wireless Telegraph Company it was denied that the patent rights of the system had been sold in America. An agreement, it was alleged, had been reached, but not executed.

A BILL has been introduced in the Reichstag of Berlin, Germany, providing punishment for the theft of electric power. Such a bill ought scarcely to be necessary in an-up-to-date community.

THE following bulletin, "Latest from the Front," was recently circulated in Wall Street: "General Cronje-Keene, the hero of Sugar, the great strategist of General Electric, the conqueror of Cordage, the destroyer of Whiskey, the lifter of Lead, the defender of Leather, the consumer of Tobacco, the protector of Brooklyn Rapid Transit, the butcher of bulls, is now completely surrounded in the Third Avenue laager. About \$3,000,000 worth of his ammunition has already been blown up (or in). Reinforcements under Field Cornet Lamar have been repulsed, with heavy loss, and Gens. Roberts-Rockefeller and Kitchener-Whitney have refused to grant any armistice and notified Cronje-Keene that they intend to bombard him into unconditional surrender to avenge sundry financial Majubas."

From the news received from South Africa it is clear that telephones are being largely employed for communication purposes by the British forces on active service, says the London "Electrical Engineer." At Ladysmith the outlying positions are connected by telephone with headquarters, and this connection proved of great service when the town was attacked last month. At Mafeking also, Colonel Baden-Powell has a telephone service arranged with all his outposts, so that he receives quickly the information of any move on the part of the surrounding forces. The latest news, however, is from a letter from a private soldier in the Grenadier Guards, to the effect that a Boer spy has been found to be using telephone communication from a bouse within the English lines at Modder River, presumably to the Boer position. The end of that spy is said to have been as sudden as the switchingoff operation in a telephone exchange.

ACRITICISM of the multiple-unit system of railway propulsion by Mr. George Westinghouse has brought out the following reply from Mr. Frank J. Sprague, which appeared in a recent issue of the N. Y. "Herald": "The letter from Mr. George Westinghouse in a recent issue of the "Herald," incidentally supporting a suggestion to use in the rapid transit tunnel steel motor cars on which to concentrate all the power necessary to operate a train, seems really to have been an attack on what is now known as the multiple-unit system of train operation, that is, the simultaneous control from any selected point of two or more equipped cars in a train, which system I first introduced on the South Side Elevated in Chicago. The plea advanced is that of danger from fire.

It is a pity Mr. Westinghouse is so pessimistic, and in view of the demands of modern transportation and the development now being made to meet those demands, he seems somewhat ingenious. Those demands are essentially the movement of cars in trains of various lengths at high schedule speeds, and at such frequencies as will meet the needs of traffic. The existing or proposed equipments for the new and old Berlin elevateds, the Liverpool Overhead and the Waterloo and City Railways, London, the Brooklyn, Boston and probably the Manhattan elevateds, all call for two or more separate motor equipments in a train. Hence it would seems that the engineering world did not agree with Mr. Westinghouse, With one unimportant exception the fires which have occurred on elevated electric cars have been when large powers were concentrated on a single car, which has been overworked, and were partly due to early inex perience in wiring."

The royal vaults under the Albert Memorial chapel at Windsor Castle have been lighted by electricity.

An arch surmounted by a reproduction of the latest type of automobile is soon to be erected at the extremity of the Avenue de la Grand Armée in Paris to the memory of Lavassor. Lavassor did much to promote the interests of the automobile. This is doubtless the first instance of the introduction of the motor vehicle into sculpture.

In the laundry of an insane asylum at Pontiac, Mich., electric irons instead of gas irons have proved to be peculiarly adapted for insane asylum service, where most of the work is done by the patients. There is no chance of setting anything on fire with the irons, which are kept at an even temperature and do not-require the exercise of judgment in changing them.

A NOVEL use has been found for an electrical stove by the water board of Marquette, Mich. The stove has been put in the intake pipe which supplies the water to the city works from Lake Superior, and its purpose is to keep anchor or needle ice from forming on the sides of the pipe and finally stopping the flow. The stove is the invention of the superintendent of the local electrical plant. It is a resistance coil like those used for heating street-cars, and is made in circular form to fit within the intake pipe, the water passing through it. Current is furnished to the stove at slightly above 100 volts, and the plan is to keep it in constant operation when weather conditions are favorable for the tormation of needle ice. It is not necessary that any great quantity of heat should be generated, a rise of two or three degrees being sufficient to melt the ice as fast as it forms. The cost of the apparatus is \$25, and this expenditure will save at least \$100,000 for a new and deeper intake.

In Moscow, Russia, the city authorities were recently a little dubious as to the merits and advantages of electric traction for street railways. Accordingly the local tramway company installed a storage battery system on a short section of its line for the purpose of demonstrating the possibilities of electricity for this purpose. This proved very successful, and they then very speciously suggested the introduction of a mixed trolley and storage battery line; but the authorities are now said to be holding out for a conduit system.

A CABLE dispatch states that the Uganda railway telegraph line reached Ripon Falls on February 19, thus establishing communication between Lake Victoria Nyanza, the source of the Nile, and London.

A COUPLE in Binghamton, N. Y., were recently married by phonograph. It had been decided that the bride's father, who was a clergyman, should perform the ceremony, but during his absence in the South he was taken ill and died before his daughter's return. Before expiring however he recited the marriage ceremony into a phonograph and the cylinder was made use of later to unite the couple.

THE New Haven (Conn.) Railroad Company will soon have an electric feeder for its steam line. One of the branches of the road, running from Attauwaugan to Dayville, will connect at the latter place with the steam lines of the company, and be operated largely for freight by an electric engine hauling five freight-cars of the ordinary size. This will be the first attempt of the New Haven Company to adapt a trolley line to freight as a feeder of a steam road. The new trolley system, of which several miles are already in operation, as an original enterprise is one of the largest in Connecticut, and has the novelty of construction with the main object of feeding a steam road instead of competing with it.

L. S. GARDNER, of New Lisbon, Wis., referring to his electric gun, says: "This weapon promises a deadliness beyond the most horrible dreams of warfare. It is built along strange lines. Instead of being pushed out from the breech, the projectile is pulled out through the muzzle by a system of powerful magnets and spit into space at a velocity regulated by the wishes of the operator. The gun is open at both ends, and the projectiles may pour from its muzzle as fast as they can be fed into the breech. There is no recoil, and a tube of glass would serve as well as one of steel. Indeed the model of this wonderful weapon is made of glass." Mr. Gardner is now in the East seeking capital, but it is doubtful if he

It is quite evident that the Germans are upto-date in all matters pertaining to science applied to industry. In Bavaria an association of farmers has been formed for the purpose of erecting large electrical works to be devoted to agricultural uses. The current requires for its production a force of 150 horse power, which is supplied partly by steam and partly by water power. Several villages are supplied, while farmers are furnished movable electrometers for threshing machines, chaff cutters, etc. Every farm in the district is connected with the plant.

BICYCLE riders have often wished for some handy little motor attached to the post of the machine that would do the work of propelling. Such a device has been designed. It is, in fact, a two-wheeled automobile, with pedals attached as in a bicycle, for use when wanted, and a full horse power motor mounted on the front part of the frame, the forks being doubled to give sufficient strength. A fuel tank, or carbureter, is attached to the top tube of the frame. The ignition is by an electric spark—an improvement over the former motors. Sufficient fuel can be carried for a seventy-five-mile run. The speed is from fifteen to twenty-two

miles an hour. The pedals are on the "free-wheel" combination, and are needed only in starting or on very steep grades, as the motor is sufficiently powerful to carry the rider on any ordinary road. The motor weighs twenty-two pounds, bringing the total weight of the wheel up to about sixty-five pounds. The brake is applied from the front handle-bars by a hand-break on the rear hub. The motor can be instantly disconnected.

ITALY has made up its mind not to be behind hand in matters electrical and as a consequence numerous important undertakings are on the eve of being started. Among others a central power station to supply an electric railway is projected at Bassignana, while an electric trolley road to connect Milan and Varese has received the sanction of the Government.

Last week the Creusot gun works in France were destroyed by fire resulting in the loss of a large amount of gun material and electrical stores. It was at these works that the Boers obtained a large number of their cannons.

The Bergen County Traction Company which operates between Fort Lee and Englewood, N. J., is experimenting with a new headlight on one of its cars. The light is produced by means of an electric arc and is of 3,500 cp., so it is claimed. With this type of headlight a motorman has at night a clear view of the track for at least two hundred yards ahead of the car.

THE Jenkins underground electric system, invented by a Richmond electrician, was recently tested in Baltimore and proved a complete success. It will probably be adopted on some of the lines there.

Argangements for equipping the Manhattan Elevated Railroad in this city with the third-rail system are rapidly progressing. Mr. W. E. Baker, of the engineering construction department, is responsible for the statement that much of the contract work has been completed and only scarcity of material and lack of sufficient skilled labor will delay the installation of the system.

UNTIL recently the experiments made to sterilize liquids by means of electricity have failed, says the "Electrical Engineer," London, because the application of continuous current decomposes the liquid and thus renders it useless, while alternating currents of the frequency usually employed are not sufficient to destroy the microbes which are the cause of the fermentation against which a remedy is sought. According to a writer in "El Telegratista Espanol," by the name of Meritens, all microbes in wine can be killed in a few seconds by the application of alternating currents of high frequency and low potential, which at the same time conduces to conserve the wines. Mr. Meritens has made an apparatus which consists of a narrow glass tube through which the wine to be treated passes. Inside the tube there is a series of metal disks. These are insulated, and each is in communication with one of the terminals of an alternating-current dynamo. The speed of the liquid is regulated by a valve so that it can be subjected to the action of the current for any given time. It is said that the invention has proved of considerable commercial value.



# NOTES ON ELECTRIC TRACTION UNDER STEAM RAILWAY CONDITIONS.\*

BY EDWARD C. BOYNTON.

On many of the large steam railroad systems in the United States, there are certain sections which present the most favorable conditions for the substitution of electricity for steam as a motive power. These conditions are the result of increasing density of population, and mean that better and cheaper transportation facilities are needed by the public than are provided by the steam road.

The electric street railroads quickly took advantage of these conditions, and by building lines more or less parallel to the steam roads, soon acquired a large share of the local passenger traffic. The fault with the steam road was not that the motive power was steam, but the fare was too high and the train service too infrequent. The whole question of the substitution of electricity for steam hinges upon that one point.

In order to provide satisfactory transportation facilities, the steam road must double or quadruple the number of its trains, and reduce the fare to at most one cent per mile. When there is sufficient density of population, this will surely cause a large increase in the number of passengers carried. This increase is due principally to the fact that many people who could seldom afford the expense of traveling would then make frequent trips. It is very doubtful whether the greater number of steam trains can be operated at a sufficient profit with the low fare. Here, then, comes in the change in motive power, with the sole purpose of decreasing the operating expense.

I wish to call attention to two classes of local passenger traffic which should be considered as distinct from each other. The suburban traffic of a large city is well understood, and its characteristics are usually such as would make the change from steam to electricity profitable. The low fare will induce a part of the population to make their homes in the suburbs, and thus increase the travel. But where there are competing trolley lines, the steam road, which we will suppose has electric motive power, needs one more facility than those mentioned, and that is, high speed. Without that, there would be little advantage over the competing lines.

It has been proved by experience that the speed must be at least as great as an average steam train, and there is no doubt that if the speed be made as high as the fastest steam express train, the popularity of the line would increase. It is well known that the business man who desires to travel from one city to another, or to and from his residence and his place of business, cannot be carried there too rapidly. It would probably surprise the average passenger on one of the fast steam express trains to be told at a certain time that he was traveling 70 miles per hour, and yet such speeds are reached every day, for short distances, over a straight, level track.

The other class of traffic referred to is that existing between cities and towns in close preximity. Let us assume a case as an example.

In a certain densely populated manufacturing State, there is a city larger than any other within fifty miles radius. Within that radius are several towns and small cities not over twenty to thirty miles from the larger city.

These are connected by the steam road, which maintains what is considered a reasonable train service, and one that is as frequent as the traffic seems to demand, at the rate of fare charged, which is from two to two and onehalf cents per mile. The trains are quite heavy, nearly always fully loaded, and are run from two to three hours apart. Together with its freight traffic, such a road pays well, judged from the steam road's standpoint. Suppose that electricity be substituted for steam in that section, and a train service consisting of two, or three car trains running every half hour from each end, with a maximum speed of fifty to sixty miles per hour, and the fare reduced to one cent per mile. There is no doubt in the minds of those who have watched the development of such cases, that the increase in traffic and low operating expenses would result in a far greater profit than was ever earned by that section of the road. It is well-known that such conditions exist on our steam railroads in many localities.

It has been said that the steam roads will begin by equipping their branch lines with electric motive power, and little or nothing is heard of the equipment of the main trunk line. It is necessary to define what is meant by a branch. In a large system some branches are 100 miles long and may be double tracked: others are from 6 to 40 or 50 miles in length. In the assumed case described above, the conditions may exist on one of the large branches or even on the main trunk line, which may have four tracks. It should make no difference in deciding the question of equipping the part of the system which possesses the desired conditions, whether it is on a branch or a part of the main line. It should be fully understood that no steam railroad will equip any portion of its lines, except with the provision that nothing shall be done which will prevent the running of steam and electric trains over the same track.

## THE QUESTION OF EQUIPMENT.

The questions, how much will it cost to equip a given service to be operated by electricity?-and how much will it cost to operate it? are frequently asked. The electrical engineer is now in a position to answer both these questions with great accuracy. The experimental stage has passed, and sufficient data is at hand to give all the information needed. It must be realized that the operation of a steam railway by electric power introduces many conditions which do not exist in the transportation problem within a great city, such as are operated by the elevated or surface street railroads. There are no restrictions on speed or weight of trains. Rapid acceleration is not of so much importance, for the stops are much further apart. The trains must be operated under steam rules absolutely, and the whole equipment must comply with the laws relating to steam railway trains. The railway company contemplating the equipment of a part of its system with electric motive power has the choice of several methods which should be closely studied to determine which is best suited for the service it is proposed to operate.

These methods are:

First—The purchase of electric locomotives of sufficient power and weight to haul its standard passenger coaches.

Second—The equipment of a number of its standard coaches as motor cars.

Third—The purchase or building of a sufficient number of special light passenger coaches, some of which are equipped as motor cars, and the withdrawal of its standard coaches entirely from this service.

Fourth-Shall freight be hauled by electricity or steam?

The use of electric locomotives for the purpose under consideration depends upon several conditions. If the travel is heavy, that is 2,000,000 passengers per year and upward, the service frequent, the speed high, requiring an average train of four cars, and as may be the case. the same coaches must go much further than the electric service extends, hauled by steam, it is advisable to use electric locomotives hauling standard coaches. Their principal advantages lie in their ability to perform the work of a steam locomotive in every respect, and this is frequently a strong point in their favor with the railway managers. They are thus able to accommodate themselves to congested traffic which usually occurs on holidays and possibly at certain times every day, by simply increasing the number of coaches hauled as is the practice with steam locomotives. Such locomotives should weigh from 100,000 to 150,000 pounds, should have eight wheels and four motors, so that the total weight is available for traction. They must be provided with sufficient power to haul at least double the average train without over-heating. They must not only be able to perform the work of a steam locomotive in the same service, but should do it at a faster schedule speed. The rapid acceleration of a train hauled by such a locomotive enables it to perform the above duty without any increase in the maximum speed. In switching cars, the ease and rapidity with which the electric motor can be handled is a great advantage.

It is necessary to equip these electric locomotives with the best automatic air brake system that can be obtained, for several reasons. They must operate the existing brake system on the coaches as well as the steam locomotive does. The law requires automatic brakes and a whistle. An independent motor compressor with a large main reservoir is therefore almost imperative.

The cost of repairs on an electric locomotive should be exceedingly low, possibly 10 per cent, of that required by a steam locomotive on account of the fewer moving parts and the entire absence of the boiler and its necessary equipment.

The fact that an electric locomotive requires but one set of controlling and air braking apparatus is a distinct advantage over other methods of employing electric motive power. This is evident, not only in the first cost but in the fewer parts to be cared for.

The second method of applying electric motive power to an existing steam railway; the equipment of standard coaches as motor cars, will appeal to all steam railway managers as the cheapest and most convenient way to make the change. This method has strong arguments in its favor.

The locomotive carries its own paying load and during the hours of light travel can be run light, without hauling other coaches. A standard coach equipped with two motor trucks and four motors will haul nearly as many coaches as the locomotive above mentioned and will weigh 100,000 lbs. It will easily handle five coaches making a six car train weighing loaded 450,000 lbs. I believe that the power consumed per passenger carried in a train hauled by an electric locomotive will be less than if all the cars were motor cars, whether run singly or in one train.



<sup>•</sup> Abstract of paper presented at the 140th meeting of the American Institute of Electrical Engineers, New York, February 28, 1900.

Let us see exactly what must be done to a standard coach to equip it as a motor.

In most cases the conditions will be such that three or four car trains with a proper schedule will be sufficient to take care of the maximum traffic. This necessitates only two motors for the coach, These should both be mounted on one truck, and this truck complete with motors will have to be purchased and used to replace one of the standard trucks. The motor truck should be built especially for the purpose, a heavy steel truck, 36 to 40-inch steel tired wheels, brakes of the type that do not require brake beams, springs both elliptic, and equalizer of sufficient strength to support the weight of half the car body with maximum load, and this means all standing room occupied. The size and general design of the axle in the motor truck must be carefully considered. The author does not believe that steel axles 5" maximum diameter between wheels, are safe. It may be that in calculating their strength and considering the enormous strains which they must withstand, the result appears satisfactory, but experience shows that the excessive vibration at high speeds will cause crystallization of the steel and a high factor of safety must be employed.

The wheel journals should be at least 5\(\frac{1}{2}\)' x 9", and the diameter of axle between wheels 6\(\frac{1}{2}\)', with a larger diameter through the axle gear.

The wheel base cannot well be more than seven feet, on account of the curves, but it is nearly all needed in order to obtain room for motors of sufficient size. The motor should not be supported by the truck frame in any way.

Steel bars should be placed at each side of the motors extending from one axle to the other, and beneath them, just inside the wheels. These should be suspended from lugs on the motor frame by suitable links as near the center line of each axle as possible. backs of the motors can then be carried on these bars by means of other lugs on the motor frame and springs above and below the lugs. This method of motor suspension is rapidly coming into general use and it has many advantages. If motors should be damaged it is simply necessary to place another pair of wheels and axles with other motors in the same truck frame. The motor cars ride much easier, or practically the same as before they were equipped with motors, due to the fact that the jarring of the motors is not transmitted to the car body.

The motor car must be wired for, and furnished with a suitable number of electric lights and heaters, which is a simple matter. The same thing must be done for the coaches it is proposed to haul. The latter should also be equipped with collecting shoes connected by a wire which terminates at each end in an electric coupler of sufficient capacity to supply the motors on the motor car if necessary. The motor car is supplied with the regular air brake apparatus used by the road and piped as a steam locomotive, except that the car is double ended and requires an engineer's valve, gauge and other necessary parts at each end.

The independent motor air compressor, main and auxiliary reservoirs, car wiring cables, main wires for collecting shoes, rheostats and electric couplers, all go under the car in addition to the standard equipment of a passenger coach.

A small cab should be provided at each end for the motorman preferably inside the car,

fitted with a front and side window which can be opened to their full extent. Here are located the air brake valves, the automatic governor and switch for the compressor, the motor controller, main switch, circuit breaker, electric light and heater switches. The bells or gongs, pilots and whistles at each end complete the list.

The total weight of a 60-foot standard coach equipped as a motor car with two motors will be about 80,000 pounds, without passengers, of which 55,000 pounds is on the drivers or motor truck. The speed of such a motor car running light, if geared sufficiently high, is probably only limited by its weight and the quality of its track and road bed. With a stone ballasted track, 100-pound steel rails, few curves, and those of long radius, a heavy car with the best steel tired wheels should run 100 miles per hour at full speed without difficulty.

I have mentioned a four-motor car consisting of a 60-foot car body weighing 100,000 pounds complete. This represents about 800 hp. nominal rating of the motors at 650 volts direct current, and this is the maximum hp. that can be placed under a standard coach, on trucks and wheels which do not necessitate any other changes in the existing standards of steam practice. The motors are capable of exerting double that power for a short time. The total cost of converting a standard coach into a motor car with two motors is about \$3,800.

The third method of using electric traction in steam service, that of the use of light motor cars and trailers, built for the purpose, has some advantages. The former coaches can be used elsewhere on the system as are the locomotives. The smaller, lighter cars are cheaper to construct, the wear on the track is less, and there is considerable economy in power. It has been proposed, and no doubt will come, that such cars will run through the the principal street of a city on the existing street car track, before starting on their trip over the steam track. This would necessitate either a trolley wire over the steam track, instead of a power rail, or both collecting shoes and trolley pole on the car. There is no question but that this may prove a great advantage in time. On the other hand, the cars must be used exclusively on the line equipped with electric power. At speeds of 50 to 60 miles per hour which must be made in order to compete successfully with the existing parallel trolley lines, the cost of maintenance and repairs due to the excessive vibration will undoubtedly be greater than that with standard coaches.

The economy in power due to the reduction in dead weight hauled is of considerable importance, not only on account of the smaller amount used, but the line conductors can be lighter, greatly reducing their cost, or the system can be extended to longer distances at no more expense for transmitting the power.

The fourth question, that of hauling freight by electric power, should, of course, be decided upon at the time of installation, as it may cause considerable difference in the plans for power stations and line transmission. As the question can only refer to local freight along the line electrically equipped, it is of doubtful importance as applied to the conditions under discussion. If the freight traffic on such lines be sufficiently heavy to necessitate the use of a locomotive for several hours daily during the hours between midnight and morning when there are few if any electric passenger trains in service, it is economy to use an electric loco-

motive, for it costs but little more to run the power station, if it has been shut down, and the total expense would be somewhat less than that of a steam locomotive. The whole question of transportation of freight by electric power is one which concerns the future more than the present.

When the time arrives that long distances are electrically equipped on our steam railways, then it becomes far more important.

POWER TRANSMISSION.

Feeders.—The transmission of electric power forms the most important part of the problem of the electrical equipment of a steam road. At the present day our railway motors all require the direct current, and we are therefore limited to its employment in the working conductor. By increasing its voltage from that usually employed to 700 volts, a considerable advantage is at once gained, and without additional expense in motors or generators. Experience has shown that the economical radius of operation of a power station generating such a current and delivered to the line without feeders is from 10 to 12 miles. This refers to a heavy train service with a fairly frequent schedule, and an average load of 500 amperes on each radial line of single track.

By the line or working positive conductor is here meant a steel rail of 90 to 100 pounds per yard, well bonded, and equal in conductivity to about 1,200,000 cm. of copper.

The Working Conductor.—In considering a train service consisting of heavy trains running at the speeds mentioned, the trolley wire as a working conductor will probably not come into general use, although it is used for such a service to-day. The cost of construction, maintenance and depreciation is greater than that of a third rail. It has few advantages, and many disadvantages for such a service. It is now generally conceded that an insulated rail placed close to the track answers all requirements, and the author's experience shows that it is satisfactory. It is difficult to understand, however, why the common form of T-rail is so generally used for this purpose unless it is due to a desire to save money by using up old rails, as a more inconvenient cross-section for thorough and efficient bonding could hardly be selected.

One question which has been studied with care is of great importance in this latitude, and that is the effect of ice on the contact surface, and how to get rid of it. Many experiments have been tried, and few can be said to have been successful. A further possible advantage of the use of some other form of pelled steel might result in the complete elimination of this trouble. I refer to the collecting shoes having a side or under-running contact. This would allow the partial roofing over the conductor by wood, which would thoroughly protect it from the weather.

Insulation.—The question of insulating the positive rail of a 700-volt grounded circuit has in actual practice been developed to such an extent that the results obtained are remarkable, to say the least. If such methods as are now in use had been proposed ten years ago, they would have been regarded as impracticable.

For years it was the custom to consider the ground a conductor of electricity. It was of course realized that the surface rails must be bonded in some way, but the ground was considered to be a great aid to the rails in returning the current. I do not propose to deny that this is true in a crowded city where there



are thousands of tons of iron pipes buried but a short distance beneath the rails, but can we call this a ground return? My experience shows that the road bed of a steam road consisting of sand, gravel or rock ballast, when dry, is a good insulator, and when wet there is but little difference. A rock-ballasted track in particular needs no insulation whatever except the wooden ties.

I am aware that such a statement may be regarded with doubt, but perhaps it can be made clearer if we take all things into consideration. The road runs through an open country, the soil is of the average composition, some of it wet, but most of it dry. If we stand on a wet spot and place our body in circuit from positive to ground we receive a shock, perhaps of maximum voltage. This would apparently show the ground to be a conductor, but a little thought will prove that it conducted a few milli-amperes only. If we stand in dry earth or on a tie, we feel no shock. But the one test that proves the insulation of such a line is the leakage test. From tests made every night, for over a year, the leakage average 1 ampere per mile in dry weather to 11 amperes in wet weather, and I am convinced that nearly all of this is in the underground work necessary at grade crossings and switch points. The above refers to a rail insulated upon creosoted wood blocks attached to the ties. A complete covering of snow, has little or no effect on the leakage. The form of the positive rail may influence the leakage somewhat. For example, the inverted V form acts as a roof to shed water and keeps the contact surface between the block and rail dry. But there is in use several miles of ordinary T-rail as a positive conductor, laid on blocks of wood 14" thick attached to the ties, not creosoted, but dipped in an insulating compound. No leakage is noticeable here. We can easily understand that if any appreciable amount of the current in amperes should leak through these blocks whether prepared or not, they would burn up. The writer, therefore, believes that such insulation of the positive rail for the current and voltage under discussion is ample, and much expense can be saved by steam roads by its use.

Track Bonding.—One of the most necessary and at the same time expensive parts of the work in changing existing steam roads into an electric line, is the bonding of the service rails. The author believes he has done some of the heaviest bonding in the country, and is of the opinion that there is no satisfactory method of bonding a T-rail at present. When such bonding costs two dollars per joint, it becomes a very serious matter. Bonding around the angle plate with the bonds about two feet long, is out of the question, for the cost of copper would be too great, and it would be exposed. Riveting the lugs on the bonds through the web of the rail, is not good practice, because to secure sufficient area of contact four holes would have to be drilled in the ends of each rail, which so weakens it as to render it unsafe. The shortest possible bonds should be used under the base of the rail. 1t requires four one-inch holes in the base of each rail, and we can easily see how unsatisfactory and expensive this is, with four bonds of 300,-000 cm. area for each joint of 100 pound steel. In nearly all rail bonds the principal resistance is in the contacts. It is a simple matter to use sufficient copper, but to secure a proper contact is a difficult problem. The bonds must have the utmost flexibility to withstand the

vertical motion of the rail ends, and even then many of them will gradually break off strand by strand. What is urgently needed at the present day is a cheap and efficient bond for a T-rail. Such a bond, to be satisfactory, must show no greater fall in potential than an equal length of the rail itself, when the maximum current is flowing through the joint. On account of the fact that the ground is practically of no value in augmenting the conductivity of the return circuit, the entire circuit must be regarded as metallic, and the ground should not enter into any calculations.

Power Stations.—The writer does not propose to enter into the subject of the design and arrangement of machinery in a power station for a steam road, as there are no engineering features which differ from those encountered in such a station intended for a large street railway. An abundance of water and cheap fuel are of course important points. Such power stations can be built for from \$80 to \$90 per kilowatt, exclusive of the land.

A few words about the amount of power required may be of interest. An important figure is the amount of power delivered at the switchboard per train mile. It eliminates all losses due to resistance of circuit, and current used for air compressors, electric lights and heaters. This figure will vary from four to six kilowatt hours per train mile, reaching its maximum in December and January, due to the longer hours of lighting the cars, the constant use of electric heaters, and the frequent running through snow.

The question of heating a standard coach by electricity is one that should be thoroughly understood. Street car heating is totally different. The public demands the same temperature as is furnished by steam, which is 68° or 70° F. It makes but little difference what heater is used, provided there are enough of them. One may radiate its heat faster than another, and so raise the temperature of the car more rapidly, but it will require, in any case. from 12 to 15 kilowatts of energy for each coach. An ordinary train, consisting of a motor car and two coaches weighing 200,000 pounds, will require, at a speed of 35 to 40 miles per hour on a level track, about 125 kilowatts, or about 166 hp., of which the car alone would consume 75 kw., if running light. The motor will consume an average energy of four to five kilowatt-hours per train mile, or 40 to 50 watt hours per ton mile. Power can be produced with condensing engines and fuel at about \$2.30 per ton, for about .008 (eight-tenths of a cent) per kw. hour.

.Cost of Operation,-It is most desirable in operating a heavy electric service over a railway on which steam trains are also operated, to arrive at a satisfactory conclusion as to the comparative cost of operating each type of train per mile. If an electric service is entirely substituted for one which has been operated by steam, the railroad company is in a position to know accurately the difference in cost of the two systems. But when both are operated over the same tracks the problem becomes very complex. For example, even if we omit the maintenance of the road way, which may be a little higher in an electric service. there are many other items, such as salaries of agents, ticket sellers, gatemen, etc., all of which properly belong to the operating department, which must be proportioned between the two services. It may be said that the cost of operating a steam passenger train has been estimated all the way from 30 cents to \$1,00

per mile depending upon the length of the train and other conditions, which are seldom alike in the different localities. The author cannot go into this subject in detail, but will give a few points of difference between the two services upon which an approximate estimate can be based. A fair average cost of running a steam locomotive, including fuel, when coal is about \$2.30 per ton, water, wages, repairs etc, is 22 cents per mile. The average cost of repairs to coaches may be taken at one cent per mile each. The wages of a train crew, consisting of a conductor, baggage master and one brakeman will average .05 per mile making a total of 30 cents. This figure is intended to represent the lowest possible cost of operating a train of only three cars by steam with the understanding that it is kept almost constantly moving for about 9 hours, and covering from 150 to 200 miles. It is well known that a train making but a few miles per day cannot be run at a profit, either by steam or electricity, due to the fact that cost of wages per mile increases rapidly, as the crew has to be paid the same in either case. A great advantage of the electric service may be mentioned here. The above service is all that can be required of one crew and one locomotive, but the motor car can easily make 300 to 400 miles in 18 hours, and as the daily service is in operation at least that long, one motor car does the work of two locomotives. In the operation of a similar three-car train in which one car is a motor car, we will assume the same crew with the addition of a motorman and omit the locomotive. The cost per mile in wages will then become 6½ cents, that of repairs to cars the same as before, 1 cent, maintenance of motors, ½ cent, and cost of power delivered to train, 6 cents, making the total cost per train mile, 14 cents for the electric service.

### NOVELTIES IN ACCUMULATORS FOR TRACTION PURPOSES.

Under the above title Herr Zacharias has an article in the first number of the "Centralblatt fur Accumulatoren und Elementenkunde,' dealing with the growth of the employment of accumulators for traction purposes. After referring to the early attempts which were made in 1884 by Julien in Brussels and Reckenzaun in London, to introduce accumulators for the propulsion of tram-cars, Herr Zacharias points out that the early failures prejudiced the tramway companies and others against the employment of accumulators, and so the manufacturers of the latter were forced to obtain the necessary experience by laying down short tram-lines at their own cost. The foremost firms in this field of work were the Aktiengesellschaft. Hagen, and the Wattaccumulatorenwerke, who about 1896 made extended trials in Berlin. But the cast-ribbed pattern of the Planté plate, first adopted by the Hagen Company, and the narrow mesh grid plate of the Watt Company were both found unsuitable, and have been since superseded. The cast-ribbed plates were not only heavy, but they were less durable than had been expected, chiefly because it was impossible to cast the plate thick enough to give strength and to be at the same time homogeneous. The "Watt" plate, on the other hand, lacked rigidity, and the carbon dust or carbonized filament diaphragm which was inserted between the plates interfered with the free circulation of the electrolyte, so



that the acid at the bottom of the cell became of much greater density than that at the top, with injurious results to the plates. Rolled lead has been substituted for the manufacture of Planté plates, but before this was introduced many other methods for making the plates more homogeneous had been tried. The plates had been forced between very finelygrooved rollers, so as to increase greatly the ribbed surface, or they had been pressed into moulds of various patterns which would give a large surface, but with no very satisfactory result, as such plates 'are always rather heavy. Dr. Majert was the first to manufacture Planté plates from sheets of rolled lead, employing a special form of plane. Another method of manufacturing positive plates of the Planté type is the "Monobloc," which is employed by the Aktiengesellschaft l'Electrique in Brussels. The positive plate in each cell is formed of a compact block consisting of about 120 sheets of lead, each 0.5 mm. thick, which are held together by a hard lead frame, and four corner pieces which are burnt on to the lead sheets. The plates are perforated according to their size, with from 20 to 30 holes 10 mm. apart. The negative plates are composed of quadrangular tubes 0.5 mm. thick, which are formed of lead hardened with a very little antimony. These tubes are filled with highly porous and spongy lead, and are provided with numerous longitudinal openings. This construction enables a battery having a large effective surface area to be enclosed within a very small space, and after more than a year's experience has been obtained of their working in various places, it has been found that they give satisfactory results; on the Belgian State lines it has been ascertained that the cells used for running the street cars only require cleaning after 20,000 kilometers had been run, so that the company is now in a position to guarantee the cost of running per kilometer. As the results of experience gained in working, the method of construction of the plates has undergone modifications and improvements.

In the Blot accumulator rolled lead is also employed for the positive plates, but in this case it is used in the form of long strips which are rolled up so as to fit into receptacles in the plate, but this system does not allow of much expansion and contraction taking place during charge and discharge.

The chief drawback to plates of the Planté type is no longer their weight, which has been largely reduced by the improved methods of construction, but consists in the time required for their formation. To hasten this, an electrolyte is usually employed which will attack the lead, such as some salt containing chlorine; but when the formation has been completed it is most important that the plate should be freed from every trace of chlorine, for practical experience has shown that it is most injurious, about 0.00004 per cent. being the largest amount permissible. This fact and the necessary tests and treatment of the plates are now generally understood, so that it is possible to avoid undue injury from the effects of chlorine.

The use of accumulators for traction purposes will be greatly extended in the future, when the cost of their maintenance has been decreased, which will be the case when the plates can be turned out in large quantities in factories by machinery, instead of being made by hand; and the factory in Brussels has already made a beginning in this direction.—The "Electrician," London.

### AN ELECTRIC CAR BRAKE.

A company of Cologne, Germany, has introduced a brake for electric cars, in which use is made of the Foucault, or eddy currents. When the car is running at the ordinary speed the electric brake is first applied to check the motion, but to bring the car to a standstill the mechanical brake is brought into use. This brake was first used on the electric tramways in Landsberg. As the cars there have one motor only, the second axle is appropriated to the brake, and the result appears to have been satisfactory,

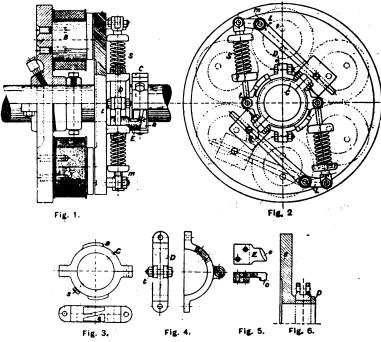
As long as the car runs at a high speed, the brake is actuated only by the Foucault currents, and the mechanical brake is brought into operation only when the speed has been so reduced that the force of the Foucault currents is no longer sufficient to apply the brake effectively, The electric brake thus does the beavy work of checking the rapid rotation of the axle, and as the mechanical brake is used only during relatively short intervals, the wear and tear on the brake shoes and wheel tires is very slight.

The brake is composed of two chief parts,

grooves of the ring C, so that the armature is driven along the axle. By aid of this arrangement the armature, as the speed of rotation decreases, approaches the brake magnets while increasing rapidity moves the armature in the opposite direction.

The effect obtained by mechanical action is increased by electro-magnetic current in the pole pieces of the armature, which acts during the decreasing rapidity in the same direction as the displacement. When the speed of the car increases the armature acts in the opposite direction

The brake magnets are excited by the motor, which acts as a generator. Both axles are braked, the one by the motor acting as a generator, the other by the aid of the Foucault currents engendered in the armature of the braking apparatus. When the brake is first applied, the tension produced by the motor acting as a generator is great, and the exciting current in the brake magnets is consequently relatively strong. As speed decreases, the exciting current becomes smaller; but at the same time as the armature is approaching the pole-pieces, the intermediate space of air between the armature and the



the electromagnets B and the iron armature A (Figs. 1 and 2), both parts being carried on the car axle. The electromagnets are strongly fastened to the frame of the truck, having no rotation. The winding of their fields F is such that the current passes through them. thus forming alternately the north and south pole. The armature is keyed upon the axle in such a way that, while it rotates, it may have at the same time a slight horizontal movement along the axle. Opposite to the center of the armature lies the ring D (Fig. 4), constructed of two pieces and can be rotated. Peculiar iron pieces E (Fig. 5) are fastened on its circumference. The ends of these pieces are rounded and slide through the inclined groove A of the ring C (Fig. 3). The ring C is secured upon the axle with a screw. The connection of the ring D with the weights Q is obtained by the aid of the lever mechanisms L (Fig1 and 2). The movable weights change their distance from the axle in accordance with the speed of the axle as the centrifugal force increases, and give a rotation to the ring D, by which the sliding pieces E change their position in the

\*From the "Tramway and Railway World," London.

magnets, and consequently the magnetic resistance diminishes, so that, in fact, the efficiency of the brake compared to the first effect obtained, has not diminished. As the speed is checked, the exciting current of the magnets and the produced Foucault currents are by reason of the slow movement very small, and the armature is pressed against the brake magnets. The mechanical brake then reinforces the Foucault currents and stops the car. The brake is enclosed in a sheet iron casing, and is thus protected against dirt and moisture.

### Berlin Electric Railways Cause Magnetic Disturbances.

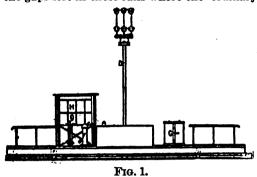
The technical institutions in Berlin, Germany, have laid a memorandum before the Reichstag respecting the electric and magnetic disturbances due to the electric tramways and railways in Berlin. In this memorandum it is pointed out that as soon as electric traction was first started on the circular railway the disturbances were felt in the Imperial Institute,  $2\frac{1}{4}$  miles away. This has necessitated special precautions being taken to prevent the instruments for measuring small currents from being affected.



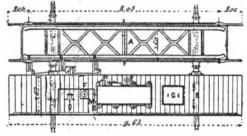
### AN ELECTRIC TRAVERSER FOR RAIL-WAY CARRIAGES.\*

### BY M. SABOURET.

In the Orleans Railway Station at Paris an electric traverser is used to carry railway carriages from one line of metals across on to adjoining rails, and the apparatus used is of particular interest because no trench is used for the same. The rails on which the traverser runs are practically level with the ordinary running rails, a system of duplicate bearing axles being used to get over the difficulty of the gaps left in these rails where the ordinary

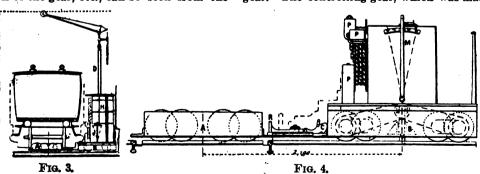


running rails are crossed. In the illustrations herewith, for which we are indebted to the Revue General des Chemins de Fer, drawings of the arrangement of the traverser carriages are shown, from which it will be seen that there are two distinct trucks, one of which takes the railway carriage, while the other is



F1G. 2.

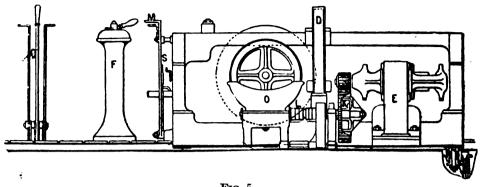
provided with the electrical arrangements for moving the same. The motor truck only differs from the carrying truck in slight details. Of course, it could be kept much shorter, but it is convenient to use the same traversing rails, and hence it is made practically of the same dimensions. This truck is also fitted with a hauling arrangement, by which the carriages can be drawn on to the transporter truck. The details of the gear, etc., can be seen from the



illustrations. Thus Fig. 1 shows the general view of the truck with collecting gear, while Fig. 2 is a cross-section of the same. Fig. 3 is a plan of the apparatus showing the two trucks coupled together, Fig. 4 is an end elevation showing the driving gear, and also one view of the hauling rope. Fig. 5 is a front elevation of the driving gear, showing the way in which

the motor is mounted, which can also be further seen in the plan (Fig. 6). Three trolley wires are used to take the current to the motor, because in this railway station electricity is distributed on the continuous-current system at 375 volts with 125 volts between each pair of wires. We gather from the description that two of the trolley wires supply the armature at 375 volts. The remaining wire is used for ex-

consumption of energy was found to be required; first when the traverser was working without load, and next when it was loaded with 13 tons. In starting it took from 8 kw. to 9 kw. light, and 12 kw. to 15 kw. when loaded. At a small speed of about one yard per second the kilowatts varied from 2.5 to 3.7 with the traverser light, and from 3.7 kw. to 5.2 kw. when it was loaded. At higher speeds up to about



F1G. 5.

citation purposes, there being 125 volts between it and one of the first pair. The rails are not used at all for conducting the current.

The arrangement of the reducing gear between the motor and the axle can be readily seen in the drawings, as also the arrangement of clutches for throwing the hauling rope in 11 yards per second only a slight increase in the consumption of energy was observed, varying from 3.7 kw. to 4.5 kw. when the traverser was running light, and from 6.4 kw. to 8.2 kw. when the traverser was loaded. It seems that the apparatus is doing good service at the above railway station, as no less than 250 to 350

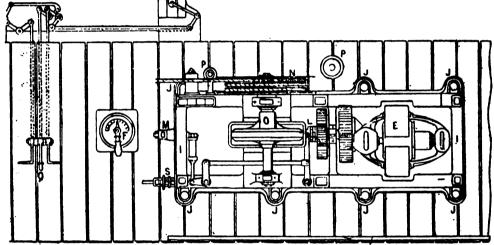


Fig. 6.

and out of action, and for connecting and disconnecting the driving power to the axles. Chains are used to transmit the motion to the two axles of the truck, and these axles are also geared to the other two by means of chain gear. The controlling gear, which was manu-

factured by the firm of Sautter-Harlé, provides for five different speeds. The first of these corresponds to a connection of all the resistances in circuit; the second and third steps are obtained by successively cutting out resistances; the fourth step reduces the series excitation of the magnet, while in the fifth step a resistance is inserted in the shunt circuit. From trials made on the railway the following

vehicles are transported during 24 hours. It is used particularly in connection with post office service, for the mail trains which are made up at this station. In this case the hauling gear is almost as often needed as the traverser, but owing to the limited time it is found advantageous to move the trucks to the traverser by horses. The cost of the whole, including the necessary rails for crossing 20 sets of metals, the truck for transporting the carriages, the motor truck, and all the electrical apparatus, came out at £1,800.

ACCORDING to the Cleveland (O.) "Leader" a Massachusetts genius has succeeded in attaining results that, so far as sheet metal work is concerned, are almost equal to what he would be able to accomplish if he had rediscovered the secret of tempering copper. The inventor has made sheets of seemingly pure copper of wonderful thinness and with the springiness, strength and capacity for being tempered that steel has. Many thousands of dollars have been spent on the experiments, and the few sheets of the new material that have been made cost a great deal more than their weight in gold. The process consists in rolling a hot steel plate and two heated copper plates at the

<sup>\*</sup>From the "Electrical Engineer," London.

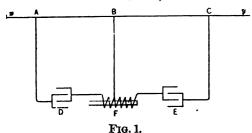
same time in such a way that the copper forms a skin over the surfaces of the steel and gives it all the weather resistance that pure copper has, that it will not rust, and has at the same time the strength of steel, is the claim made. It can be stamped as well as tin, and crimped or otherwise worked in ways and under circumstances that would be impossible with sheets of copper.

### A FARADMETER.\*'

### BY M. I. PUPIN.

The art of measuring the capacity of a condenser has not yet reached that stage of perfection which can be justly claimed for the resistance measurement. The prevailing method is the ballistic galvanometer method. Leakage and absorption can and often do introduce serious errors into this method. These errors can be reduced to any desirable limit by employing alternating currents of appropriate frequency.

This was the principal consideration which led to the construction of the faradmeter which forms the subject of this note. In addition to this consideration, which concerns

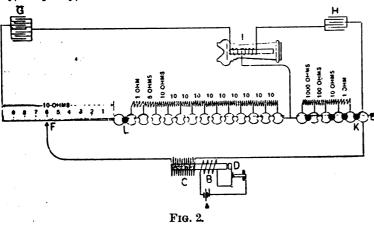


the accuracy, there is another very important consideration which must be taken into account and that is the convenience of the method and the cheapness and durability of the apparatus to be employed. Much of the capacity measurement work, especially in connection with telegraphy, telephony, and the construc-

tained in the telephone. Then capacity of D: capacity of E:: resistance of BC: resistance of AB. It is understood, of course, that the resistances AB and BC are non-self-inductive and that the capacity reactance of each condenser is in its own circuit by far the greatest element of the impedance. It will be seen presently that these conditions are fulfilled in the apparatus shown in Fig. 2, which our fellow member, the well-known mechanician, Mr. Baillard, constructed for me and employed in some work which he has been doing for me during the last two months.

In Fig. 2, A is a cell which feeds into the primary B of a small induction coil provided with an interrupter such as is used in electrotherapy. The secondary c is connected to a row of resistance coils E and L. These resistances are arranged in convenient steps as indicated. The resistance coils L have in addition several equal lengths of manganin wire F stretched over a graduated scale. The resistance of the coils as well as of the manganin wire is carefuly calibrated once for all. The condenser H is a carefully constructed mica condenser of known capacity. G is the condenser the capacity of which is to be determined. I is the differentially wound telephone. The approximate adjustment is accomplished by the plugs which control the resistances E and L, and the final adjustment is made by the manganin wire by a sliding contact F which varies the length of the manganin wire to be introduced, and therefore varies the drop which acts on one of the condensers. With ordinary frequencies capacities up to several microfarads can be determined with an accuracy of a small fraction of one per cent, easily and rapidly.

It is self-evident, of course, that in place of the differentially wound telephone I, we can use an ordinary telephone and place it in the bridge which connects a point between G and H to a point between the resistance coils E and L. The conditions of balance are the same as



tion of alternating current machinery, has to be done under conditions under which it is quite inconvenient to employ the ballistic galvanometer. I believe that the faradmeter described here will be found to answer quite satisfactorily all reasonable requirements as regards convenience.

The theory on which the construction of this meter is based is very simple, as follows: Let xy (Fig. 1) be a conductor through which an alternating current flows. D is a condenser of known capacity and E is a condenser of unknown capacity; F is a differentially wound telephone. Connect as indicated and adjust the resistances A B and B C until silence is ob-

\*Paper presented at the 140th Meeting of the American Institute of Electrical Engineers, New York, February 28, 1900. in the method employing the differentially wound telephone. In many practical cases this second method is preferable.

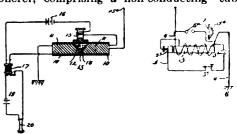
### Susceptibility of Trees to Lightning.

The overseers of nine forestry stations in the dukedom of Lippe, in Germany, have made an examination of trees struck by lightning throughout an area of 45,000 acres, in order to ascertain for the German Government the susceptibility of various trees to lightning and its effects and occurrence in general. As a result of their observations, says the Philadelphia "Manufacturer," it was found the oak tree was by far the most liable to lightning, in spite of the fact that they were not as frequent as other trees in the forest. The percentages of the various species were given as follows:

Beech, 70 per cent.; oak, 11; pines, 13, and firs, 6. During the several years through which these observations were made, 275 trees were struck by lightning, and of these 159 or 58 per cent. were oaks, 59 or 21 per cent. firs, 21 or 8 per cent. beeches, and 20 or 7 per cent. pines, the other varieties damaged being still less in number.

### A Wireless Telegraphy Patent.

On February 27 a patent was issued to Archie F. Collins of Saratoga Springs, N. Y., on a wireless telegraphy receiver which embodies several new features and is herewith shown. What the inventor claims is "a receiving apparatus for wireless telegraphy consisting of a coherer, comprising a non-conducting tube,



aligned conductor-plugs arranged within the tube and having their separated inner ends beveled to form a V-shaped pocket, which is adapted to receive comminuted magnetic particles, a conductor-strip of high electrical resistance bridging the inner ends of said plugs, a local circuit embracing said plugs, and magnetic particles, a relay and a magnet in said circuit, the latter being arranged to act on said magnetic particles, substantially as and for the purpose set forth."

### SOCIETY NEWS.

### The New York Electrical Society.

The 203d meeting of the New York Electrical Society took place Friday evening, March 2, at the College of the City of New York. A most interesting lecture was delivered by Dr. A. R. Ledoux on "Copper from the Ore to the Wire Bar," during which a number of copper specimens were exhibited. The attendance was quite large.

### American Institute of Electrical Engineers.

The 140th meeting of the Institute, was held at 12 West 31st street, New York City, on Wednesday last.

A note on "A Faradmeter" was presented by Dr. M. I. Pupin, and the instrument described and explained by the author was exhibited by him. Messrs. Hering, Wolcott, Bradley and Reed took part in the discussion.

A paper was presented by Edward C. Boynton, of New Haven, entitled "Notes on Electric Traction Under Steam Railway Conditions." The discussion was opened by Mr. F. J. Sprague and continued by Messrs. Hutchinson, Hanchett, Lamb, Ries, Pope, Holbrow, Mailloux, Atwood and Emerson.

At the meeting of the Executive Committee in the afternoon the following associate members were elected:

Henry Howell Barnes, John Duncan Boyd, Clement W. Evans, Lewis Warner Henry, A. M. Hunt, Wm. G. Lawrence, J. L. McaCreary, H. D. McVay, Morris M. Neurath Frans Oscar Renstrom, Mariano L. Schiaffino, Walter Eugene Smith, George Lourie Wiley, J. M. Zapata.

Mr. Edward J. Willis, of Richmond, was transferred to membership.

It was voted by the Executive Committee



that the Annual Business Meeting should be held in New York City on May 15, the date fixed by the constitution, at which the ballots for new officers will be canvassed. On the afternoon of the following day, May 16, the General Meeting for the reading and discussion of professional papers will open at Philadelphia, continuing possibly for three days.

### LEGAL NOTES.

Colorado Springs lately won an important victory in the United States Circuit Court. The suit filed by the Pike's Peak Power Company against the city of Colorado Springs was dismissed by Judge Hallett, who declared the ordinance giving the company a lease on the water system of the city, to generate power and electricity, was void as it was granted by the council without the necessary two-thirds vote of the people.

Judge Perkins rendered a decision in the Circuit Court a short time ago by which Joplin. Mo., was decreed the right to furnish commercial lighting from its municipal plant, which it recently completed. The decision was founded on the grounds that the city of Joplin being a corporation and the petitioners for an injunction being a corporation, that one was authorized as much at the other to compete in this line of business.

### Another Souvenir from the American Electrical Works.

The American Electrical Works of Providence, R. I., which never fails to suitably commemorate the leading holidays and events of the year, has forwarded to us a handsomely gotten up steel engraving of Martha Washington with the gateway of Mt. Vernon dimly outlined in the background, and accompanied by a tastefully printed card which says:

The wives of great men have rarely been prominent figures in and of themselves. They have found their greatest happiness in exercising the peculiarly feminine and wifely qualities, and by their quiet encouragement and sympathy aiding perhaps more than the world realizes, in the pronounced success of their husbands. Such was

### MARTHA WASHINGTON,

the subject of the steel portrait we send you on this Anni versary of the birth of Gen. George Washington.

Martha Washington, wife of George Washington, was born in New Kent County, Virginia, May, 1732, daughter of Col. John Dandridge. In June, 1749, she married Daniel Parke Custis, who died in 1757, leaving her a wealthy widow with two children. She was married to Washington in January, 1759, and died at Mount Vernon, Virginia, May 22, 1802, two years and five months after the death of her illustrious husband.

Beautiful, domestic, loyal, devoted, she was a representative of the best type of American women.

AMERICAN ELECTRICAL WORKS. Providence, R. I.,

General Offices and Factories, Phillipsdale, R. I.

### Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended February 24:

Amsterdam, 225 cases, \$11,825; Antwerp. 27 cases, \$15,845; Argentine Republic, 111 cases, \$7,804; Belfast, 2 cases, \$384; Berlin, 1 case, \$10; Brazil, 83 cases, \$3,028; Bremen, 2 cases, \$20; British East Indies, 4 cases, \$192; British Possessions in Africa, 12 cases \$649; British West Indies, 20 cases, \$607; Central America, 30 cases, \$1,248; Chili, 9 cases, \$76; U.S. Colombia, 8 cases, \$244; Dutch East Indies, 1 case, \$70; Havre, 351 cases, \$47,616; Japan, 15 cases, \$639; Liverpool, 170 cases, \$10,017; London, 338 cases, \$14,-167; Marseilles, 85 cases, \$7,125; New Zealand, 12 cases, \$302; Peru, 135 cases, \$638; Porto Rico, 25 cases, \$547; Riga, 3 cases, \$567; Southampton, 62 cases, \$1,024; Urguay, 1 case, \$5.

The following were the exports during the week ending March 3:

Alexandria, 1 case, \$48; Argentine Republic, 390 packages, \$28,325; Brazil, 43 cases, \$1,743; Bremen, 1 case, \$42; British East Indies, 83 cases, \$11, 384; British Possessions in Africa, 5 cases, \$313; Brussels, 1 case, \$71; Chili, 5 cases, \$239; Cuba, 29 cases, \$859; Ecuador, 3 cases, \$14; Hamburg, 92 cases, \$2,253; Havre, 339 cases, \$11,582; Hull, 42 cases, \$160; Liverpool, 224 cases, \$10,157; London, 58 cases, \$2,099; Manchester, 13 cases, \$3,900; Nova Scotia, 2 cases, \$48; Odessa, 5 cases, \$525; Peru, 104 cases, \$1,849; Stettin, 64 cases, \$13,241; St. Helens 191 cases, \$2,500; U. S. Colombia, 35 cases, \$541; Venezuela, 52 cases, \$109.

### PERSONAL MENTION.

Dr. James L. Weston, secretary of the Automatic Electric Car Lighting Company of New York, died at his home in Brooklyn a short time ago.

Mr. Astley C. Terry has been appointed electrician of the fifth eastern district of the Western Union Telegraph Company. All electrical work in that district will hereafter be done under his supervision. The district has about 40,000miles of wire in New York, Pennsylvania and Canada, and

Mr. Gunsanback of New York, who was formerly in the employ of the Westinghouse Company, has accepted a position with the Wetmore Electric Company at Lowville, N. Y.

Mr. W. L. Pierce, formerly superintendent of the Traction Air & Electric Company at Cortland, N. Y., has accepted the management of an electric lighting plant in another city.

Mr. W. W. Gurley was lately elected general counsel of the Chicago Union Traction Company. Mr. Gurley now succeeds to the title as well as to the position formerly held by Henry Crawford, who was temporary counsel for the Whitney interests in carrying out the deal with Mr. Yerkes.

Mr. Charles Tomlinson Rittenhouse of New York City, well known as an electrical expert, died of pneumonia last week in Denver, Col., where he nad gone for his health. He graduated with honors from the electrical department of Columbia University. When Dr. Pupin of Columbia was experimenting with the X rays in 1895, Mr. Rittenhouse conducted many of the experiments and took some of the first X ray pictures in the State. He was a member of the New York Electrical Society, the American Institute of Electrical Engineers, and an alumnus of Stevens Institute and Columbia University.

### INCORPORATIONS.

The Delaware Electric Light & Heat Company, Wilmington, Del. Capital stock, \$200,000, with power to increase to \$3,000,000. Incorporators: Joseph Swift, Henry F. Dure. Edgar M. Hoopes, Henry C. Robinson, Elwood Pyle and others.

The Boston Electric Heating & Power Company, Portland, Me .- to manufacture and deal in all kinds of electric heaters, motors and dynamos. Officers: president, W. G. Webber, of Bedford, Mass; treasurer, L. E. Russell, of Farmingham, Mass.

The St. Lawrence International Electric Company of Alexandria Bay and Clayton, N. Y. Capital stock, \$20,000, Directors: F. L. Hall, of Clayton, and W. E. Miller, Win. W. Avery, J. S. Keeler, William Leyare, A. A. Leyare and N. A. Haughton, of Alexandria Bay.

The Indianapolis Power Plant Company, Indianapolis, Ind. Capital stock, \$300,000. The Central Trust Company is the concern's financial agent.

The United Gas & Electric Company, Syracuse, N. Y.—to manufacture gas and electricity. Capital stock, \$4,000,000. Directors: L. Bedell Grant and John T. Kirk, of Brooklyn, and Ashley T. Cole, of New York City. The company takes over the business of the present Syracuse Electric Light and Syracuse Gas Companies, and its operations will extend throughout Onondaga County.

The Ohio River Electric Railway & Power Company, Racine, O .- to operate a railway between Middleport and Racine. Capital stock, \$300,000.

The Kanawha Traction & Electric Company, Montgomery W. Va.-to build and operate an electric railroad. Capital stock, \$100,000. Incorporators: G. W. Champ, E. W. McCormick, M. J. Simms, B. H. Early, all of Montgomery; C. W. Dillon, of Fayetteville.

### ELECTRICAL PATENT RECORD.

This department is edited by OSCAR A. MICHEL. Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR 4. MICHEL. Nos. 302-304 Broadway, New York City. N. Y., or 639 F street, N.W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.

### LETTERS PATENT ISSUED FEBRUARY 27, 1900.

### ELECTRIC RAILWAYS AND APPLIANCES.

644,094. Electrical Bond for Railroad-Rails. James M. Price, Philadelphia, Pa.; Walter F. Price and William L. Price executors of said James M. Price, deceased. Filed April 23, 1894. Renewed Jan. 16, 1990.
644,108. Contact Device for Conduit Electric Railways Carl F. P. Stendebach, Leipsic, Germany, assignor to Electricitats Gesellschaft Reitz & Co., mit Beschrankter Haftung, same place. Filed Sept. 28, 1899.

### ELECTRIC LIGHTS AND APPLIANCES.

644,160. Electric Glow-Lamp. Wilhelm Boehm, Berlin, Germany. Filed Feb. 2, 1899.
644,408. Car Lighting System. John L. Creveling, New York City. Filed Oct. 28, 1899.

### ELECTRICAL MACHINERY AND APPARATUS.

644,051. Controller for Alternating-Current Circuits. Ernst J. Berg Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Oct. 11, 1829. 644,072. Automatic Gravity Cut-out for Electrical Circuits. William Hanlon, Poughkeepsie, N. Y. Filed June 20, 1869.

644,672 Automatic Grivity Cutout for Lifective at Circuits William Hanlon, Poughkeepsie, N. Y. Filed June 20, 1889.
644,251. Electric-Contact Apparatus, Carl G. O. H. von Kohler, Stockholm, Sweden, assignor to the Patentaktebolaget Svea, same place. Filed Dec. 5, 1898.
644,352. Electrical Measuring Instrument. James W. Packard, Warren, Ohio. Filed Jan. 12, 1900.
644,357. Multiple-Fuse Cut-Out. James B. Hubbard and Charles J. Dorsey, Baltimore, Md., assignors of one-third to Harry T. Mudd, same place. Filed Oct. 28, 1899.
644,484. Circuit-Closer for Telegraph-Keys. Elmer E. Nye and Louis C. McIntosh, Los Angeles, Cal. Filed Oct. 28, 1899.
644,517. Resistance-Switch for Electric Circuits. John H. Holmes and Frank Broadbent, Newcastle-upon-Tyne, England. Filed Dec. 18, 1899.
644,552. Electric Meter. George Hookham, Birmingham, England. Filed Sept. 12, 1899.
644,553. Apparatus for Converting Alternating into Continuous Currents, and Vice Versa. Maurice Hutin and Maurice Leblanc, Paris, France. Filed June 19, 1899.

### TELEPHONES AND TELEPHONE APPARATUS.

TELEPHONES AND TELEPHONE APPARATUS.
644,294. Switch-Box for Intercommunicating Telephone Systems. Albert K. Keller, Philadelphia, Pa., assignor to George F. Payne, same place. Filed July 1, 1897.
644,295. Telephone-Transmitter. Albert K. Keller, Philadelphia, Pa. Filed Aug. 20, 1898.
644,206. Telephone-Receiver. Albert K. Keller, Philadelphia, Pa. Filed Aug. 27, 1898.
644,315. Telephonic Relay. Fred H. Brown, Oak Park, Ill. Filed Nov. 27, 1899.
644,547. Telephone-Transmitter. Ernest B. Fahnestock, Washington, D. C., assignor to the Fahnestock Transmitter Company, New York City. Filed Jan. 15, 1897. Renewed Aug. 5, 1899.

### MISCELLANEOUS.

MISCELLANEOUS.
644,050. Manufacture of Lead Peroxid and its Application to Electrical Storage Batteries. Hermann Beckmann, Witten, Germany. Filed Dec. 9, 1899.
644,128. Automatic Controller for Electric Compressors. Niels A. Christensen, Milwaukee, Wis. Filed Sept. 2, 1899.
644,143. Electric Gas-Lighting Candle-Burner. Ray N. Noyes, Haverhill, Mass., assignor to the Electric Gas Lighting Company, Boston, Mass. Filed April 10, 1899. Renewed Jan. 2, 1900.
644,144. Connecting-Plate for Storage Batteries. Harry G. Osburn, Chicago, Ill., assignor to J. Herbert Ballantine, Newark, N. J. Filed Feb 17, 1849.
644,278. Means for Regulating Electric Machines. William H. Cooley, Brockport, N. Y. Filed March 9, 1849.
644,311. Method of Winding Helices for Electrical Purposes, James C. Anderson, Jersey City, N. J. Filed June 15, 1899.

544,311. Method of Winding Helices for Lectrical Purposes, James C. Anderson, Jersey City, N. J. Filed June 15, 1899.
644,312. Electrical Helix. James C. Anderson, Jersey City, N. J. Filed Aug. 29, 1899.
644,407. Automatic Regulation of Systems of Electrical Distribution. John L. Creveling, New York City. Filed Ogt. 24, 1899.
644,409. Electrical Distribution. John L. Creveling, New York City. Filed Oct. 28, 1989.
644,433. Signal Apparatus for Boilers. William B. Lowe, Jr. Atlanta. Ga. Filed Dec. 2, 1898.
644,497. Wireless Telegraphy. Archie F. Collins, Saratoca Springs, N. Y., assignor, by direct and mesne assignment to the American Wireless Telephone and Telegraph Company of Arizona Territory. Filed Nov. 7, 1899.
644,510. Process of Electrical Reduction. Ellis F. Frost, Washington, D. C., assignor of one-half to Frederick A. Lehmann, same place. Filed Nov. 21, 1899.
644,538. Voltaic Cell. Albert Pfannenberg, Berlin, Germany. Filed April 15, 1899.
644,551. Electric Signaling Apparatus. Geo. Harris, Detroit, Mich. Filed Aug. 6, 1898.
644,552. Process of Reducing Apparatus Inductance of Electrical Circuits. Maurice Hutin and Maurice Leblanc, Paris, France. Original application filed June 19, 1899.
Divided and this application filed Dec. 26, 1899.

### GENERAL NEWS.

What is Going On in the Electrical World.

### LIGHTING.

Albany, N. Y.—A proposition is now before the common council to bond this city for \$250,000 for the purpose of establishing a municipal electric light plant.

Atlanta, Ga.—W. C. Rawson, of the Elizabeth Cotton Mills in this city, wants an estimate on an electric light plant.

Anburn, Neb.—R. B. Stichler has offered to put in an electric light plant here at a cost of \$15,000.

Bellville, Ill,-At a recent meeting of the council committee on lighting was authorized to advertise bids for the construction of a municipal electric light plant.

Blaine, Wash.—The Blaine Electric Light Company's plant was burned lately.

Blissfield, Mich.—The council has submitted to the electors of the village the question of raising \$3.500 to be used for the completion of the electric light plant.

Chicago, Ill.—Mandel Brothers have purchased the Wendell Manufacturing Company's plant on Armour avenue, near 22d street. An electric light plant will be installed at once.

Clayton, Del.—The residents of this place are considcisyton, Dat.—I he residents of this place are considering the practicability of establishing an electric and waterworks system for this town.

Clinton, Ill.-E. S. Nixon has been granted a franchise for erecting and conducting an electric light plant

Collinwood, O.—Bids will be received until March 12 for furnishing all work and material necessary for the construction of an electric light plant for this vil-Address L. A. Wilson, clerk.

Coquille, Ore.—An electric light plant will soon be

Dickson, Tenn.—The city council is considering a proposition from a private company for the erection of an electric light plant here.

Elbow Lake, Minv.—The citizens have voted to bond the village for \$7,500 to put in an electric light plant, to be owned and operated by the village.

Ellisville, Miss.—This town is discussing the question of erecting an electric light plant.

Ft. Wayne, Ind.—Several residents of the south side have been talking about establishing a private electric plant for lighting their homes.

Grav's Lake, Ill.-C. Wollie is preparing to erect an e ectric light plant here

Hanover, O.—A petition was submitted recently, asking the council to grant a vote at the coming spring election, that the town be bonded for an electric light

Houston, Tex.—Plans will soon be prepared for the new 500 are and 6,000 incandescent electric light plant. Address City Engineer Potter.

Iela, Kan.—This town contemplates the erection of an electric light plant.

Ishpeming, Mich.—A proposition to install a munici-pal lighting plant will be submitted to the voters of this city at the spring election.

Libertyville, Ill.—The Libertyville electric light plant was burned last week, and is a total loss. It will be rebuilt at once. A. L. Burge is the manager.

Louisville, Ky.—The general council contemplates the establishment of its own electric lighting plant in

Mansfield, Tex.-Mansfield is to have electric lights scon.

McMinnville, Ore.—Many citizens have offered to furnish the money for the purchase of a new electric light plant.

Monroe, N. Y.—Mr. Day, proprietor of a mica mill, expects to put electricity in the mill in the near future. He proposes to generate enough to supply the village or to any others who may wish to light their s with it.

Morehead, Ky.—A company has been formed, headed by Wm. Rice, formerly of this place, for the purpose of establishing a waterworks system and an electric light plant.

New Cambria, Mo--There is a movement on foot for an electric light plant to light this city.

Palestine, Tex.-St. Louis capitalists are figuring on tting in a large electric lighting and power plant in this place.

Red Oak, Is.—A franchelectric light plant here. -A franchise has been granted for an

Richmond, Va.-The city engineer, W. E Cutshaw, wants estimates on a plant of 500 lights, wiring and boiler already in position. An engine, dynamo, steam, supply and exhaust pipes and proper connections with witch boards are also required.

Scotland, S. D.—The authorities have decided to light this town with electricity, and steps are now being taken for the establishment of a lighting plant.

Shippensburg, Pa.—Messrs. Shryock Brothers have sold to John Hosfield, of this place, the mill site and

water power at Middle Spring. Mr. Hosfield intends to put the waterway in repair and will establish an electric plant, and conduct the current to Shippens-burg for running machinery and perhaps electric lighting.

Sorento, Ill.—The citizens of this village are talking f establishing an electric light plant in the near future.

Stephen, Minn —The citizens of this place are talking of building a municipal electric lighting plant.

ing of building a municipal electric lighting plant.

Tallahassee, Fla — The city council is considering bids for the building of a new electric light plant.

Washington, D. C.—Col. Theodore A. Bingham, in charge of public buildings and grounds in the District, has recommended to the Secretary of War that Congress be asked to appropriate \$26,500 for an electrical plant for the Washington Monument.

Waverly, Neb.-The citizens of this place are considering the proposition of an electric light plant to be owned by the town.

White Oake, N. M.—A stock company has been formed to establish an electric plant at this place.

Youngstown, O.—The Merchants' Heat, Light & Power Company recently incorporated, contemplates extensive improvements on their plant in the near future.

### STREET RAILWAYS.

Asheville, N. C.—The Montford Electric Car Line, of this city, has been bought by E. B. Bliss & Co., capitalists of Chicago and Kentucky. The line will be extended at once by the shortest route to Weaversville, a distance of eight miles.

Castile, N. Y.—The citizens of this place are interested in the proposed electric railroad between this place, Silver Springs, Pike and Perry.

Cleburne, Tex.—A committee was sent to Fort Worth recently to meet some Cleveland, O., capitalists in regard to building their proposed electric road from Dallas to Fort Worth on to this place. Messrs. Coffinbury and Bishop will confer with Cleburne people further about this line.

Columbus, O.—The Columbus Freight & Traction Company, recently incorporated by W. D. Brickell, W. D. Park and W. D. Hamilton will construct an electric street railway in this city.

Ft. Worth, Tex.—The city council has granted a franchise to Messrs. Bishop and J. D. Coffinbury of Cleveland, O., to build the proposed electric line in this city in connection with the road betweed Ft. Worth and Dallas. The estimated cost will be \$700,000.

Galion, O.—A preject is said to be under way to construct an electric railway from here through to Mt. Vernon, making when complete a through line.

Gardiner, Me.—The question of building an electric road will be presented to the voters of this place at the March election, and the hearing before the railroad commissioners will be held the latter part of the month.

Louisville, Ky.-The Louisville Railway Company has decided to make a number of improvements to its present electric line and will expend about \$200,000 during the year. T. J. Minary is president of the

Manchester, Va.—The Virginia Railway & Develop-ment Company has decided to build an extension of its electric line from Richmond here.

New York.—It is now claimed that former Governor Morton, John D. Rockefeller and J. Pierpont Morgan of this city are anxious to construct an electric railway in opposition to the Central Hudson road. It is claimed that such a company has already been formed. The plan is to gradually construct a line, beginning at this city, until Albany is reached.

Onancock, Va.—It is now certain that Onancock will have an electric car line which will connect this town with Accomac Courthouse, crossing the railroad at Tasley station.

at Tasley station.

Philadelphia, Pa,—The journey from this city to New York by trolley is in sight. This is the opinion of both lawyers and railroad men, in view of the opinion just handed down by the Supreme Court, ordering back to the Buck's County Court for a rehearing the question in dispute between the Philadelphia & Bristol Railway Company and the Pennsylvania Railroad.

Plain City, O.—There is some talk of organizing a stock company to build an electric road from this city to Mt. Sterling via London, providing arrangements can be made with the proposed Columbus, London and Springfield line to secure power.

Sycamore, III.—Application has been made for the incorporation of the Geneva Lake, Sycamore and Morris Electric Railroad Company with its principal office here. The line is to extend from Morris, III., to Geneva Lake, Wis., with branches to De Kalb and Belvidere. The capital stock will be \$150,000.

Syracuse, N. Y.—The Syracuse & Oneida Electric Railway Company has secured franchises from every town through which the proposed electric street railway is to be built and work will be commenced as soon as possible. W. B. Kirk, T. W. Meacham E. F. Allen and others are directors.

Winslow, Me.—A good deal of interest is shown in the matter of a proposed electric road from here to North Vassalboro.

### MANUFACTURING, ETC.

Pittsfield, Mass.—At a recent meeting of the Stanley Electric Manufacturing Company, the final legal transfer of the property of the company to F. W. Robeling, of Trenton, N. J., was made. The company was reorganized and has been capitalized at \$2,000,000 under the laws of New Jersey. It is reported that the Stanley Electric Manufacturing Company will erect six new mills, at a cost of \$500,000.

Ravenna, O.—It is reported that the Orient Electrical Company, manufacturers of incandescent lamps and other goods in that line located in Youngstown, O, will remove here this spring.

Trenton, N. J.—The Berlin Manufacturing Company was recently incorporated with a capital stock of \$200,000, to manufacture railroad cars, steel cars, trucks, wheels etc. This company controls the Haan patents for freight cars and other devices. It will build a factory in New Jersey.

### COMPANY MATTERS.

Chicago, Ill.—The Hartley Electrical Company was one of the firms occupying the brick building at 51 to 55 Jefferson street, that suffered loss by the recent fire.

Monrovia, Cal.—The Monrovia Electrical Power Company has been merged into the newly incorporated United Electric, Gas & Power Company which has also purchased the interests of the Santa Monica, Long Beach and San Pedro plants. The company proposes to put into Monrovia a first-class electric plant.

Newburg, N. Y.—The Consolidated Gas, Electric Light & Power Company of this place has increased its capital stock and bonds with the intention of purchasing the plant of the Consumers' Gas Company.

Washington, D. C.—A bill has been lately introduced by Representative Corliss which grants to the Michigan & Lake Superior Power Company of Sault S. Marie, the right to use water for its canal from St. Mary's River, on condition that the height of the water in the river is maintained.

water in the river is maintained.

Waynesboro, Pa.—D. M. Good, Jr., president of the Geiser Manufacturing Company of this place, large maunfacturers of separators, traction engines, etc., recently made a contract with H. G. Nergararian & Bro. for the largest single order of their machinery ever purchased for export to the Orient. The value of the deal could not be ascertained, but Mr. Nergararian admitted that the ocean freight bill alone would amount to considerably over \$6,000.

Winning Man.—The Brandon Electric Light Com-

Winnipeg, Man.—The Brandon Electric Light Com-pany intends incressing its capital stock to \$125,000, and apply to the Legislature for power to build a dam on the Little Saskatchewan River to supply power for running electric street cars and a telephone system.

### POWER AND TRANSMISSION PLANTS,

Ceresco, Mich.—The Kalamazoo Valley Power Company, which has the immense dam and power at Allegan, has decided to build a second plant at this place on the Kalamazoo River. The company bought this water power several years ago, with a view of doubling its capacity. This new dam will give enough electrical power to supply all southern Michigan, in fact more than can possibly be used.

Easton, Pa.—The Lehigh Power Company has purchased a two-acre tract of land near Raubville, on which it is proposed to erect a large plant along the Delaware Canal for generating electricity. The plant is to be operated by water power.

### AUTOMOBILES.

Amesbury, Mass.—A representative of a New York automobile company recently placed with local carriage manufacturers probably the largest order received here in many years. The New York firm has contracted for the delivery of from twenty to thirty finished automobile bodies per day for six months, and as the cost of these bodies will be from \$100 to \$150 each, the contract will amount to half a million dollars

New York.—Mr. Whitney Lyon, one of the governors of the Automobile Club, is enthusiastic over the result of his test of a new electric "auto." In this vehicle, with only a single charge of the battery, Mr. Lyon was able to travel more than than thirty-eight miles, and the machine climbed the steep Fort Lee hill. The "auto" weighs 2,000 pounds. It is of two and a half horse power, and has a storage battery of forty cells. Mr. Lyon started from the Waldorf-Astoria and proceeded to the Fort Lee ferry. After crossing the ferry the machine had before it a test under which all other electrically-propelled vehicles had failed. But this "auto" took to the hill as if it were just what it was looking for. Mr. Lyon continued north to Palisades avenue, turning west into Englewood. After running around Englewood for a while the return trip was made to West 66th street, this city, and there was still enough current left for a trip to the Battery.

Rocky Hill, Conn.—There is considerable talk of

Rocky Hill, Conn.—There is considerable talk of putting on an automobile carriage from here to the trolley. car station at Wethersfield. Several have pledged \$100 each.



# THE TELEPHONE WORLD.

### Blow to Bell Monopoly.

The completion of a deal whereby the Erie Telegraph & Telephone Company passes into the hands of the Telephone, Telegraph & Cable Company of America was announced on the 27th ult. The combined interests of the Erie Company on February 15 had 115,000 telephone stations in 2,300 cities and towns, and 250,000 miles of wire.

The company owns 71 per cent. of the Cleveland Telephone Company; 79 per cent. of the Northwestern Telephone Exchange Company, and 70 per cent. of the Southwestern Telegraph & Telephone Company, operating in Ohio, Minnesota, North and South Dakota, Texas and Arkansas, under licenses from the American Bell Telephone Company. It secured control of the Michigan Telephone Company and the Wisconsin Telephone Company in 1890, and last month it acquired control of the Detroit and New State Telephone Companies, both of Michigan. The capital stock of the Eric Telephone & Telegraph Company was increased in December, 1890, from \$5,000,000 to \$15,000,000.

The negotiations for the purchase of the controlling interest in the Erie Company have been conducted by President Latta and Charles E. Adams, of the Cable company, and President Gildden of the Erie system. The stock was gradually picked up in the market until the necessary amount was secured. The following men have been added to the board of directors of the Erie, representing the new owners of a centrolling interest in the property: Charles E. Adams, Lowell, Mass., who has been elected vice-president; John Jacob Astor, New York; George Crocker, San Francisco; Frank A. Cutting and Frederick A. Farrar, Boston; H. E. Gawtry, W. H. Gelshenen, Martin Maloney, C. W. Morse, Daniel O'Day, Frank Tilford and H. R. Wilson, New York, and William J. Latte, Philadelphia.

### Bill to Charter Virginia Telephone & Telegraph Company.

A dispatch from Richmond, Va., to the Washington "Star" states that it is "openly charged and not denied that the Southern Bell Telephone Company is behind the bill to charter the Virginia Telephone & Telegraph Company. This measure is exciting a great deal of interest in legislative circles. Nearly every city in the State has representatives here fighting its provisions. The principal objection to it is that it suspends a portion of the law that has been upon the statute books for fifty-two years, which in effect provides that a city or a town council shall have the right to say whether or not a telegraph or telephone company can use its streets."

Under this act the company proposed to be incorporated can enter a city or town without the permission of the council, but will be subject to such "reasonable regulations" as may be imposed. It is claimed by the opposition that the "reasonable regulations" provision would cause much litigation.

### The Fort Wayne Independent Company.

The Home Telephone & Telegraph Company of Fort Wayne, Ind., has just issued a directory of 1,850 subscribers. The Home Company was organized and began business about three years ago, and now has more than twice as many subscribers as the Bell Company, which formerly controlled the Fort Wayne service. The towns of Northern Indiana have nearly all established local concerns to fight the Bell Company, and have established exchanges covering nearly 1,000 cities and villages.

A new telephone company is organizing in Worcester, Mass., with the purpose of establishing an independent system of telephones. Some of the men interested are Fred W. White, former president of the common council; R. James Tatman, Charles H. Hildreth 2d, Charles M. Thayer and R. F. Taylor. The promoters of the new company are not ready to divulge the whole of the plans. Organization has not been completed. They are confident, however, the plan will be a go, and that they will be able to get the desired franchise from the city. They have sounded a number of individuals who have all said they would subscribe to the system, and some of them to the stock of the company.

Meeker, Col., is to be connected with the outside world by telephone during the coming summer. The Western Slope Telephone & Telegraph Company has been incorporated, and George T. White, formerly cashier of the Bank of Meeker, is the resident manager of the enterprise. For the present the line from Rifle to Meeker will be constructed, and bids have been called for the furnishing of about 1,700 posts for these forty-three miles. Later on the line will be extended to Craig Hayden and Steamboat Springs.

The New York Telephone Company has filed plans for the fireproofing of its exchange, 111 to 115 West 38th street. The work has been figured to cost \$45,000 by the architect, C. L.W. Eidlitz.

### The Independent Telephone Movement in Massachusetts.

The officials of the Massachusetts Telephone & Telegraph Company state that all subscribers of the company in Boston will be enabled to converse over the system next fall. The approach of spring will permit the contractors to push the work of laying conduits, which during the winter months has been slow and tedious. The company now has one mile of conduits laid and ready for service.

The company has wire connections with Springfield, Taunton, Brockton and other cities as well as towns in that section of the State. Within ten days a temporary central office will be opened and service will be inaugurated between the 40 subscribers on the line of conduits now laid. The service will be both local and long distance.

The Massachusetts Company has a plant in operation at Stoughton, Mass., with 100 subscribers. In Waltham the company has just closed negotiations for its central station and service in that city will be in operation very shortly.

### The Bell Company May Not Move.

The "Boston Journal" says: "Bell Telephone officials are disinclined to talk much about the sharp decline that has been recorded by their stock. They, however, profess ignorance of any intention on the part of the Western Union people to enter the telephone field. Recent intimations have come from official sources that strong hopes are still entertained by the Bell people that the Massachusetts Legislature might, during its present session, so shape legislation as to remove from Massachusetts. These expectations, in the light of recent developments, are quite full of suggestion, and they have aroused a suspicion in the minds of many people that the Bell Company has really practically [abandoned whatever purpose it may have had of removing its corporate residence from this State."

### Allegheny's New Telephone Line.

Mayor James G. Wyman, of Allegheny, Pa., has signed the ordinance giving rights of way to the Pittsburg & Allegheny Telephone Company, the new independent concern and branch of the United Telephone Company of Baltimore, which is building a national system to compete with the Bell monopoly.

At the annual meeing of the Canadian Bell Telephone Co. in Montreal recently the 20th annual report was read and was in part as follows: 2.841 subscribers have been added during the year, the total number of sets of instruments now earning rental being 84,923. The company now owns and operates 343 exchanges and 450 agencies; 1,686 miles of wire have been added to the long distance system in 1899; of these 318 miles are in the Ontario department, and 1,368 are in the eastern department. The long distance lines now owned and operated by the company comprise 18,920 miles of wires on 6,229 miles of poles. In December the directors, acting under the power conferred upon them, offered to the shareholders at par 9,900 shares of new stock, in the proportion of one share of new for each four of old, practically all of which have been subscribed for. Since the last report, the building in London has been completed, a building has been erected in Parkdale, and a building for the stores department has been erected in Montreal, all of which have been paid for. There is no encumbrance whatever on any of the company's real estate. The directors elected were Messrs. C. F. Sise, Robert Mackay, John E. Hudson, Robert Archer, Wm. R. Driver, Hugh Paton, Charles Cassils and Thos. Sherwin.

A dispatch from Elkton, Ind., states that the Cecil Telephone & Telegraph Company has been conveyed by deed, seed by Henry A. Richardson, of Dover, president of the ecil Company, to the Eastern Shore Telephone & Telegraph Company. The revenue stamps indicate that the value of the line in Cecil is held at \$30,000. Henry A. Richardson is also president of the Eastern Shore Company, which now includes the lines in Cecil, Kent, Talbot, Dorchester and Caroline counties. President Richardson has executed a mortgage covering all the property to secure bonds to the amount of \$100,000. By the consolidation direct communication will soon be had with every town on the Eastern shore of Maryland and on the Delaware Peninsula.

A bill has been introduced in the Assembly at Albany, N.Y., by Mr. Sanders, providing that any telegraph or telephone company that supplies information to any pool room or bucket shop shall be guilty of a misdemeanor on the first offense, and the second shall be punished as a felony.

At a special session of the city council of El Paso, Texas, recently held, a franchise was granted to a telephone company which proposes to string wires and rent 'phones at a lower rate than the Southwestern Company.

### Plans of the Knickerbocker Telephone Company.

It was stated by officers of the Knickerbocker Telephone Company recently that it was the intention of the company to begin its independent telephone operations in about eight months. By the end of that time it is expected that from 15,000 to 20,000 subscribers to the new system will have been secured. The company will not begin work until at least that number has been obtained; a preliminary exchange has been established in Twenty-third street, but not for public use.

The company has had men canvassing for subscribers in Manhattan for about two weeks. It was said that they were meeting with good success, although no definite information on this point was obtainable. The rates are claimed by the officers of the new company to be 60 per cent. cheaper than those of the Bell Company. The charge is to be \$120 a year for Greater New York, whereas the Bell price, according to the figures given out at the office of the Knickerbocker Company, is \$240 for Manhattan alone. Arrangements are now being made for the establishment of exchanges in Harlem, the Bronx, on the east and the west side, and for a main exchange at Broome and Crosby streets.

### Presumably Another Bell Concern.

Articles of incorporation were filed in Newark, N. J., on the 1st inst., by the North Jersey Telephone & Telegraph Company capital stock \$15,000. Its object is to construct telephone and telegraph lines across New Jersey from the Hudson River at Jersey City to the Delaware River at Camden

It is proposed to traverse the counties of Hudson, Essex, Union, Middlesex, Monmouth, Mercer, Ocean, Burlington and Camden. The incorporators are U. N. Bethell, Walter Brown, J. H. Cahill, Joseph Cavanagh and Howard W. Thurber. As will be remarked, several of the incorporators are officers of the New York Telephone Company.

The McPherson Telephone Company has applied to the city council of Hutchinson Kan., for a franchise to construct and operate a telephone system in that city. The company does not propose to cover the town with 'phones, unless the people want them. All it wants is the right to establish a central station there for a long distance system. It now has between thirty and forty towns on its list line. If Hutchinson is added the list of towns which it will cover includes Hutchinson, Ellinwood, Great Bend, Peabody, Sterling, Chase, Bennington, Newtown, Marlon, Lyons, Salina, Mcund Ridge, Inman, Canton, Hillsboro, Little River, Lindsborg, Lehigh, Marquette, Gypsum City, Windom, Galva, New Cambria, Conway, Hesston, Canada, Mitchell, Elyria, Halstead, Truesdale, Sparta, Bridgeport, Assaria, Brookville, Mentor, Roxbury, Smolan, Kipp and Bavaria.

The Baltimore, Md., city council has passed a resolution requesting the Legislature to repeal the telephone conduit bill of 1899, under which the Chesapeake & Potomac Telephone Company has the right to construct conduits in the beds of the streets of that city.

At a recent meeting of the stockholders of the Gainesboro Telephone Company, held at Cookeville, Tenn., new officers were elected for the ensuing year. Manager J. N. Cox was re-elected. The headquarters of the company will remain in Sparta.

Binghamton, N. Y., will shortly have a police telephone system such as exists in Elmira. When the system is installed the work will be done by the Pennsylvania Telephone & Telegraph Company.

The new telephone system recently installed by the Fire Department in this city was tested a few days ago and pronounced satisfactory.

A franchise has been granted to the Rocky Mountain Bell Telephone Company by the city council of Paris, Idaho.

### TELEPHONE INCORPORATIONS.

The Carolina & Virginia Telephone Company, Henderson, N. C. Capital stock, \$10,000. Incorporators: H. P. Strause, F. C. Toepleman and J. H. Bridgers.

Muskingum Valley Telephone Company, Zanesville, O. Capital stock, \$10,000. Incorporators: R. L. Holland, J. R. Voll, H. Bethel, W. M. Bateman, J. Blankenbumer.

The Wasco Southern Telephone Company, Wasco, Ore. Capital stock, \$500. Incorporators: J. N. Burgess, F. N. Wallace and H. C. Roper.



### **ECTRICAL** SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gcn., general; g., gold; guar, guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

PASSENGER RAILWAYS.						PASSENGER RAILWAYS.							
Fant.	Par	Capital		.Rate and Date of Last Div.	Bid.	lsked.	name.	Par	Capital !		Bate and Date of Last Div.	Bid.	A=ke <b>4</b>
Albany, N Y. Mar 5 United Traction.	100	2,000,000	\$1,750,000	l <b>¾ % Q.,</b> Nov. ¹98.	125	127	Hartford Conn Mar 5 : Hartford Street Ry. Co Hartford & West Hartford RR	. 100 100	\$4,000,000 1,000,000	\$200,000 247,000	3 % S., Oct., '98.	1.0	=
(Consolidation of the Albany and Proy City Bailway.)	1						Holyoke Mass.—Mar 5 Holyoke Street Ry. Co	. 100	400,000	400,000	i % A., June, '98.	2073	212
Mientown Pa Mar 5	1					1.	Hoboken, N. JMar 5		1 000 000	1 000 000	0.84 1000		Ì
Allentown & Lebigh Val. Trac. Co Bridgeport <sup>1</sup> Conn—Mar 5:		4,000,000			105	15	North Hudson Co. (N. J.) By. Co Indianapolis, Ind—Mar 5.				8 <b>%</b> , 1 <b>892.</b>	150	-
Bridgeport Treetion Co Baltimore "Md. Mar 5	100	2,000,000	3,000,000	1 % Atg., '98.	105	•••	Citisens' Passenger Ry	· ····	5,000,000	5,000,000	•••••	2"	28
United Rail ways & micc. Cocom	. 50	24,000,000	18,000,000	••••••	161/4	16%	Lancaster, Pa.—Mar 5 Pennsylvania Traction Co Lancaster & Cej. Electric Ry West End Street Reliway		10,000,000	9,900,000 87,500		<b></b> ,	=
Roston, Mass.— Mar 5 New England Street Ry	l. 100 l. 100 l. 50	4,000,00	o I 4 0000 0000	1 % Q., Jan.15, '97' 6 % S., A. & O. 8 % S., Oct., '98. 4 % S., Jan. 2, '99.	15 85 92%	16 87 98 114	West End Streef Reliway  Louisville, Ky.— Mar 5: Louisville Ry	100		8,500,000 2,500,000	1½ %., April '98. 2½ % S., Oct. 1, '98	683 <sub>110</sub>	69
West End Street Rr. Co % pfd Boston Elevated R. R	100	10,000,000	0	25, % Aug. 98,	1,2	104	Minneapolis. Minn.—Mar 5 Twin City Rapid Transitcon Twin Oity Bapid Transit% ptd	100	17,000,000 8,000,000	15,010.000 1,712,200	13/4 %, Oct., '98.	683/i 186	4 48 181
Brooklyn City By Or earth Brooklyn Bap. Transu Co., ir earth eBrooklyn Heighte Railroad dBrooklyn City RR	. 100	200,000 12,000,000	0  20,000,000 0  200,000	8 <b>½ % Q., Jan., '9</b> 9.	67 107 257	237 671/8 109 289	Montreal, Canada.—Mar 5: Montreal Street By. Co	.50	4,000,000	4,000,000	8 % 8., M. & N.	294 1023	267 108
eBrooklyr, Queens Co. & Sub. RH Coney Island & Brooklyn RR Eings County Elevated Eings County Traction Co	100	2,000,000 4,750,000	1,884.200 1,750.000	2 ¼ % Nov., '98.	84 )		Memphis Tenn.—Mar 5: Memphis Street Railway Co	. 100	500,000	500,000	***************************************	25	_
Nassau Electric Railroadpfd /Atlantic Avenue Railroad gBrooklyn, B. & W. E. Railroad.	. 60	6,000,000	0 6,000,000 0 2,000,000	• • • • • • • • • • • • • • • • • • • •	76	77	New Haven, Conn.—Mar 5. Fair Haven & Westville RR New Haven & Centerville	. 100	1,250,000	1,000,000	8 % S., Sept. '98. 2% % A., July '96.	89	41
Buffalo N. Y.—Mar 5 : Buffalo & Niagara Falis Elec. By Buffalo Railway Co				1 % Q. Dec., '98.	74 100	75 102	Winchester Avenue RR					15	4
Columbus O.—Mar 5 Columbus O.—Mar 5 Columbus street Railroad Columbus Street Railroad , pfd	100	8,000,000	8,000,000	1 % Q., Feb., '99.	21 87½	22 8 s	Canal & Claiborne RR. Co	100 100 100	1,200,000	1,200,000	1	1485 25 101	102
Charleston, S. C Mar 5 Charleston Chy Ry. Co Enterprise City RE. Co	50 25	100,000		8 % S.	::	::	aCrescent City RRguar bNew Or. City & Lake RRguar Orleans Railroad St. Charles Street Railway	100	2,000,000 500,000	2,000,000 2,000,000 185,000 1,000,000	8 % S., Jan., '99. 4 % S., Jan., '99. 1½ %., June, '94. 1½ %. Oct., '98.	203 563	52
Chicago, Ill.—Mar 5 Uhicago At South Side R. T. RR  Lake Street Elevated RR  Metropolitan West Side Elev. By  Morth Chicago Street RR  ANorth Chicago City RR  South Chicago City Rallway  West Chicago St. RR Co  fChicago West Div. Ry  guar  tChicago Passenger Ryguar	. 100 - 100 - 100 - 100 - 100 - 100 - 100	10,828,800 10,000,000 15,000,000 15,000,000 10,000,000 20,000,000 20,000,000	0 10,828,800 0 10,000,000 0 15,600,000 0 2,500,000 0 6,600,000 0 1,608,200 0 18,189,000	8 % Q., Jan., 99.	275 11 27 76 225  991%	276 111/4 27 73 2.0  991/4 85	Ninth Avenue RRguar	. 100 ar 100 r. 100	1,000,000 1,000,000 750,000 800,000	1,000,000 1,000,000 748,000 800,000	2½ % Q. 2½ % Q., Oct., '98. 1½ % Q., Nov., 98. 1½ % Q., Jan , '99. 3½ % A., July, '98. 2½ % Q. 2½ % Q.	890 895 196	280 110 150 169 40 240 405 410 103
Cincinnati, Ohio.—Mar 5:  Oincinnati Inc. Plane Bycom Oincinnati Inc. Plane Bypid Oincinnati, Newport & Cov. St. By iOincinnati Street By. Co	100	1,000,000 150,000 4,000,000 18,000,000	575,000 150,000 8,500,000 14,000,000	% % Feb., '99. 2% % Feb., '98. 1% % Q., Jan., '98 1% % Q., Jan., '98.	83 124%	89 125	ITwenty-third St. R. R. Co gual Second Avenue RR Third Avenue RR m42d St., Manhatv'le & St. Nich. A *Union (Huckleberry) Ry Newark N. J Mar 5; Conscildated Traction Co. of R. J	. 100 v 100 v 100	2,500,000 12,000,000 2,500,000	2,500,000	••••••••••••	200 50 75 190	420 205 56 82 200
Cleveland, Ohio. — Mar 5: Akron, Bed. & Clev. Elec. Ry Cleveland City Ry Cleveland Electric Ry		1,000,000	1,000,000	3/ % Jan., '98 8-5 % Jan. '99. 3/ % Q., Oct., '98.	48 99 % 90	50 10 t 91	North Jersey Street Railway Co United Electric Co. of New Jerse Pittsburg, Pa.—Mar 5: Allegheny Traction Co	) 100 y 100	6,000,000 504,000	6,000,000 <b>504,00</b> 0	11½ % A.	275 265 56	\ 2
DetPoit, Mich.—Mar 5. Detroit Citisons' Street By Pt. Wayne & Belle Inle By Rapid Ballway Co Betroit Electric Rallway Wyandotte & Detroit River Ry	100	2,000,000 250,000 1,000,000	1,250,000 1,200,000 250,000 1,000,000	**************************************	100¾ 175 90 		Consolidated Traction Copfc pCentral Traction Co  qCitizens' Traction Co  rDuquesne Traction Co  sPittsburg Traction Co  Fedural St. & Pleasant Valley Ry.	1. 50 50 50 50 50	15,000,000 15,000,000 1,500,000	15,000,000 15,000,000 1900,000	2 %, Jan., '95. 8 %, Nov. '98. 1 % Nov. 7, '98.	28 65 693	61 70 91
Dayton O.—Mar 5 Oity Railway Cocom Oity Railway Copfd People's Street Railwaypf	100	1,500,000	1,470,600	13 % <b>3.</b>	147 170 114	145 115	Pgh., Allegheny & Man. Trac. Co P'tisourg & Birmingham Trac. Ry Pittsburg & West End Ry. United Traction Cooon United Traction Coprei	- 50 - 25 - 50	8,000,000 8,000,000 1,500,000 17,000,000 8,000,000	1,500,000 1,500,000 17,000 000		41 12 49	11 6

\*\*Unlisted. † Full paid. | Outstanding. † Ex-div.
a Leased to New Orleans Traction Company at 6 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
c Leased to Central Orosatown Railroad at 8 % on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
c Leased to Central Orosatown Railroad at 8 % on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
c Leased to Metropolitan Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1893; thereafter 9 %.
h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1893, at \$215,000 per annum.
i Leased to Metropolitan Street Railway for 18 % on stock
f Leased to Metropolitan Street Railway for 18 % on capital stock.
n Dividends of 13 % yearly guaranteed by Consolidated Traction Company.
o Controls by lease the Alleg'ny, Cent., Oitzens' Duquesne, Fort Pitt & Pitch Traction.
p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
s Leased to Consolidated Traction Company for 5 % on capital stock.
s Leased to Consolidated Traction Company for 7 % on capital stock.
s Leased to Consolidated Traction Company for 7 % on capital stock.

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NAME.	Par	Capital Authors'd		Bare and Date of Last Div.	EM.	Asked.	NAME.	Par	Cupital Authors'd		Rate and Date of Last Div.	Bid.	Actod
New Bedford Mass-Mar 5		<u>'</u>	! 		<u> </u>	<u> </u>	Boston, Mass Mar 5.	<u> </u> 				Ϊ-	<del>'</del>
Union Street Railway Co Northampton, Mass-Mar 5	100	\$850,000	\$850,000	2 %, Feb. 98.	160	165	American Bell Telephone Co Erie Telegraph & Telephone Co	100 100	50,000,000	28,650,000	1% Q., Jan., '99. 1% Q., Feb. 20, '99	812 119	814 119)
Northampton Street Rv	10c	800,000	225,000	4 % A., June '98.	170	178	New Rngland Telephone Co New YorkMar 5	•			\$1.50 p. sh. Feb '99	. 185	188
Omaha, Neb Mar 5	100	5,000,000	5,000,000	3 % A. and N.	55	65	American Telegraph & Cable Co  *Central & South Am. Teleg. Co	100	14,000,000	14,000,000	1½ % Q. 1½ % Q. 1½ % Q. 1½ % S. 1½ % S. 1½ % Q. 1½ % Q.	98	96 111
Paterson, N. J Mar 5	100	1 050 000	. ~~ ~~	-	54	ļ	*Commercial Cable Co	100	1,000,000	10,000,000	15 × 8.	1103	198 50
Providence, R. IMar 5	100	1,250,000	1,250,000	***************************************	04		Erie Telegraph & Telephone Co *Gold & Stock Telg. Coguar. 6 %. *International Ocean Tel Co.guar 6%	100	5,090,000 5,000,000	4,800,000	1 % Q., Feb., '99.   1 % % Q.		118
United Traction & Electric Co	100	8,000.000	8,000,000	¾ ⅙, Oct. '98	108	108%	Mexican Telephone Co	100 100 100	2,000,000			115 25 167	111 <b>7</b> 8 1178
Philadelphia.—Mar 5. Fairmount Park Traus. Co [5] pd.	50	2,000,000	1,770,000	2 %, Dec. '97.	28	24	*Pacific & Atlantic Telegguar. 4 % *Postal Telegraph Cable Co			15,000,000	2% % Q., Jan., '99. 2 % 8. 1 % Q.	78	82
Hestonville, Man. & Fairmount Hest'nvl'e, Man. & Fairm't6 % pfd.	50 50 50	583,900 800,000	11,988,100 1538,900	2% %, July 15, '98. 8 % S—July, '98. 3 % Feb. I, '98.	75 75	48 76 76	*Sout'n & Atlantic Telg. Co.guar.5 % †Commercial Union Telegraph Co	25 25	950,000 <b>500,0</b> 00	559,525 500,000	2 % 8. 1 % Q. 2% % 8. 8 % 8., Jan., '99	114 115	116
aFairmount Pk. & Had. Pass. Ry. Union Traction Co \$12½ pd aklectric Traction Co	50 50	30,000,000	20 020 450	3 % Feb. 1, 30.	اد <b>8</b>	3534	Western Union Telegraph Co †Div. guar. by Postal Teleg. Co.	٠٠	••••	97,870,000	1% %, Q, Jan. '99.	₹3	₹8¾
dOitizens' Passenger Ry Frankford & Southwark Pas. R	50 50		11.875.000	98 share Q. 814 sha'e A—Anr.98	345 45	451	Miscellaneous Mar 5 : American Dist. Teleg. (Phila.)	25	400,000		1 % <b>Q</b> .	21	84
Lehigh Avenue Ry. Co	50 25 50	1,000,000 1,060,000	1,000,000	A. & O. 89 share A. Mar. 98	90 8: 0	90%	Bell Teleph, Co. (of Canada.)	100 100	8,960,000	8,561,000	2 % B.	188 f8	65
decond & Third Streets Ry People's Traction Co	50 50		16,000,000	3 %. A., April, '98.	144	1:5	Chicago Telephone Co	100 100	750,000	750,000	• • • •	148	210 150
Green & Oostes Passenger Ry.	50 25	500,000	1150,000	9 % Ian 1898.	151	152 	Hudson River Telephone Co  *Northwestern Telegraph Coguar	100 50	2,000,000 2,500,000	2,000,000 2,500,000	1 <b>X Q</b>	75 117 117	76 120 120
APeople's Passenger Rypfd.  Philadelphia Traction Co	50	750,000 80,000,000	120,000,000	\$2 p. sh., Oct. 98.	 96	96½	Providence (R. I.) Teleph. Co Southern New Eng. Teleph. Co	50 100	8,000,000		-2.4.	143/4	
Ontinental Pass. Ryguar	50 50 50	1,000,000	1580,000	6 % A—Mar., '98. 86 share—July, '98.	153	157	ELECTRIC LIGHT	W		OTRI	OAL MFQ	. 00	os.
Philadelphia City Pass. Ry Philadelphia City Pass. Ry Philadelphia & Gray's Fy. RR.	50 50	1,000,000	475.000 298.650	\$7.50 share July '98 \$8.50 share July '98	202 100	203	Boston, MassMar 5:						
Ridge Avenue Passenger Ry	50 50	750,000	1420,000	812 share, July '98. 82 share July, '98.	3.8%	809	Fort Wayne Electric trust receipts. Ft. Wayne Elec Co. T. Sec. Series A.	25	••••	• • • • • • • • • • • • • • • • • • • •	••••	115 85	125 40
17th & 19th Ste. Pass. Ry. guar Thirteenth & 15th Sts. Pass. Ry.	50 50	1,000,000	[250,000] [335,000]	1% % S., July, '98.   811 ah. A., July, '58	300	••	General Electric Co. [old] com.	100	18,276,000	80.450,000 18,276,000	2 % Q., Ang., 1898. 1% % Q., May '99.	117	118
Winion Passenger Ry. Co	50 50	1,500,000 750,000	1900,000 1750,000	89.50 shre, July '98 \$10 share, July '98	269 250		TH. Elec. CoT. Secur., Series D. Westinghouse Elec. & Mfg.Co.com.	50 50	4,000,000	146,700	1 <b>½ % Q., Jan., '99</b> .	125 48 €5	1251/8 48/4 66
R schester, IN. Y Mar 5 R schester Railway Co	100	<b>5</b> 000 000	- 000 000		176	20	Westinghouse El. & Mig. Co. pfd. Westinghouse El. & Mig. Co. assent.		11,000,000	8,195,126		4.	-
Reading, PaMar 5	100	5,000,000	5,000,000	*****	1754	20	New York.—Mar 5: Edison Elec. Ill'g Co., New York *Edison Elec. Ill'g Co., Brooklyn		9,188,000	7,988,000		119	120
# Alay Passenger Ry	50	1,000,000 850,000		Semi-an.,Jan. & Jy Jan., '98.	24 133	26 	Edison Ciec. Ili g Co., Brooklyn Edison Ore Milling Co Electric Vehicle Cocom.	100 100	4,000,000	2,000,000	11/4 % Oct., '98.	8	12
thast Reading Electric Ry	50		\$1,000,000	Jan., '98.	70		tGeneral Electric Oo. [old]com. General Electric Oo. [new]"	100	10,000,000	30,460,000	2 % Q., Aug., 1898, 1½ % Q., May '99.	82 125	93
St. Louis Mo. Mar 5 Fourth Street & Arbeith My	50	800,000	150,000	2 % Dec., 1888.		<b></b> .	Interior Conduit & Insulation Co Kings Co. El. L. & P. Co	100	1,000,000 2,500,000	1,000,000		41 110	136
Jefferson Avenue Ry. Co Lindeli Ry National Railway Co	100	400,000 2,500,000 2,500,000	2,400,000 2,470,000	2 % Dec., 1888. 1½ % Jan., '99. 1½ % Jan. '99.	••	::	Pittsburg, Pa - Mar 5	İ					
Cass Avenue & Fair Grounds	••	2,500,000	2,500,000 1,500,000	1 % Oct '98.	••	::	Lilegheny County Light Co East End Electric Light Co	100 50	500,000 800,000	500,000 800,000	J. & J. Q	168	172
St. Louis RR	100 50	2,000,000 2,400,000	2,000,000 2,300,000	4 %, Oct., '98. 21/2 %, Jan., '99. 11/2 % Jan., '99.	·	-:	Philadelphia, Pa.—Mar 5 Edison Electric Light Co	100	2,000,000			144	1444
People's RR. Cocom.	50 50	500,000	500,000	50c., Dec., o	25	80	*Electric Storage Battery Cocom. *Electric Storage Battery Copfd.	100			******	9 <b>3</b> 9 <b>5</b>	93% 97
touthern Electric Ry 5 % prei.	100 100 100	2,500,000	2,500,000	3 %, Jan., '99. 8 % A., July, '95.	76¼ 68	10	Northern Elec. Light & Power Co Southern Elec. Light & Power Co	10 10	550,000 187,500	550,000 187,500	••••	30 18	18%
Union Depot RRSan Francisco, Cal.—Feb.	100	2,000,000	2,000,000	8 % A., July, 20.			Miscellaneous Mar 5: Bridgeport (Conn.) Elec. Lt. Co		<b>500 000</b>	i		47	)   45
California St. Cable RR	100 100	1,000,000	875,000	\$2.50 share, '96.	117 60	119	Missouri-Edison (St. Louis)com.	25  25	500,000		• • • •	25 ]0	43 24 5
Market Street Ry	100 100			Q., 60c. per share.	61,	68½ 16	Hartford (Conn.) Elec. Light Co Hartford (Conn.) Lt. & Power Co	100 25	850,000 175,000		••••	156	160 10
Scranton Pa - Mar 5	50	6 000 000	2,500,000		23	80	New Haven (Conn.) Elec. Lt. Cc Narragansett (Prov., R.I.) Elec. Co.	100 50	100,000 1,200,000		2 % Q., Oct., '98.	195 98	100
Beranton Railway Co	100 100	500,000	500,000		10%		Rhode Island Kiec. Protec. Co		1,000,000		18 Q 1	1144 1895	192
Springfield Ill Mar 5							From (Canada) Elec. Light Co Fhomson-Houston Welding Co Woonsocket (R. I.) Electric Co	100	1,085,000	1,085,000	8 % 8, Dec. 1, 98.	186 106	13/ 100 106
Springfield Consolidated By Springfield OMar 5	100	750,000	750,000	************			†On Aug. 17 last by a majority vot to \$20,827,200, of which \$18,276,000 is of	e of	the stock	olders th	e capital stock wa		uced
Springfield Street Ry	100	1,000,000	1,000,000	*******		11	Recently acquired the Edison Ill pany, the Municipal Electric Light	umi	nating Co.	of Brook	lyn and its constit	uent	com.
Springfield, Mass.—Mar 5 Springfield Street Ry	100	1,200,000	1,166,700	1 % A.	207	212	ALLIE		INDUS	STRIE	s.		
Toronto CanadaMar 5							Boston Mass Mar 5;						
Toronto Street Ry Montreal Street Kallway Co	100	6,000,000 4,000,000			1023/4 294	1(3)/2 295	Delaware Gas Light Cocom Delaware Gas Light Copref.	50 50	500,000	500,000 200,000	J. & J. J. & J.	72% 98	-
Washington, D. CMar 5	50	500,000	500,000			١	American Electric Heating Oo	100	10,000,000 4,500,000		2 p. sh. Jan. 26, '99	::	 :::
neit Ky. Co	100 50	112,000,000 400,000	12,000,000 400,000	65c. per sh, Oct. 97.	92	95	United Electric Securities Copfd. New YOPKMar 5:	100	••••	1,000,000	\$8.50 p sh. No <b>v'98.</b>	**	100
Ickington & Soldiers' Home Ky Georgetown & Tensllytown Ry	50 50	200,000	652,000 200,000		85 15	40 16	Jonsolidated Electric Storage Co Safety Oar Heating & Lighting Co	 100				8 150	12 155
Metropolitan RR. Co	50	1,000,000	458,900	2% % <b>Q</b> .		••	Worthington Pump Cocom. Worthington Pump Copfd	100	5,500,000	5,500,000 2,000,000	 7 % A		110
Worcester Traction Cocom.	100 100		8,000,000	3 % S., Feb., '98.	27 1.5	29 103	Philadelphia PaMar 5		.,,				
Worcester Traction Co6 % pfd. Worcester & Suburban Street Ry	100		542,500	41, 8, 1897.		85	Electro Pneumatic Trans. Co United Gas Improvement Coscrip.	10 50	10,000,000		~~	1	1 162
Wilkesbarre & Wvoming Val. Trac	100	5,000,000	5,000,000	1%, Jan., '97.	25	29	Welsbach Commercial Cocom. Welsbach Commercial Copfd. Welsbach Light Co	100 100 5	8,500,000 500,000 525,100	i i	2 X Q	575. 40	11% 5;% 41
• Unlisted. † Paid in. ‡ Full							Welsbach Light Oo., Canada	5	500,000		••••	15/8	154
a Leased to Hestonville, Man & b Consolidation Electric, Peocharges and all indebtedness of c	ple's	Bind Ph	iladelphia	Traction compar	iles.	Fixed	(ICATOOFULUUL MIE. OO	100	200,000	200,000		<u></u>	•00
Traction Company. c Practically all shares owned	by U	nion Trac	tion Com	oany.	-		Standard Underground Oable Co Miscellaneous.—Mar 5:	100	1,000,000	1,000,000	Q	175	180
d Lease to Frankford & Southw Leased to Electric Traction C	ark omp	Passenge: any.	r Ry. assu	med by Electrie Tr	actio	n Co.	*Barney & Smith Oar Cocom. *Barney & Smith Oar Copfd.	100 100		1,000,000 2,500,000	īž	2' 98	25 10)
f Controlled by Frankford & So g Leased to People's Passenger	Rail	way at \$5	per share.	-			Billings & Spencer Co	25 100	1,250,000		 1% % Feb. '98	82 58	60
h Majority of stock owned by I 4 Leased to Union Traction Con i Lease transferred to Union Tr	pan	у.	_	виў.			Johns-Pratt Co	100 100			***	105	109 8
jj Leased to United Traction Op.a, \$20,000 in 1879-1900 and \$30.0.0	omp per	anyat si	rental of	\$10,000 per annum payable semi-annu	in lally.	866-7-8 rental,	Pratt & Whitney Copfd Stillwell-Bierce Cocom.	100				42 57	49 50 65
declared as a dividend semi-annua k Dividend of 10 % guaranteed	lly. by F	Reading T	raction Co	mpany.	٠.	•		100	500,000	••••••	% Sept 1,'98.	10	90 <b>106</b>
Dividend of 6 % guaranteed b Leased and operated by the S	y Re cran	sading Tra ton Railw	ay Co., fo	npany. rmerly Scranton T	ractio	n Co.	Unlisted.						
											T		

# BONDS.

PASSENGER RAILWAY.							PASSENGER RAILWAY.						
	Amou	nt.		Interest				Amo	one.		7.44		
name.	Authorized.	Issued.	Dws	periods.	Bid.	Ashod.	nabe.	Authorized.	Issued.	DES	Leterest periods.	Bid.	Ankad
Albany N. Y.  I Date of Quotation- Mar 5 1900  The Albany Ry. Co Cons. mig. 5s. Watervielt Turnpike & RR. 1st mig. 6s. Watervielt Turnpike & RR. 2d mig. 6s. Troy Olty Railway Co	\$500,000 750,000 850,000 150,000	427,500 875,000 850,000 150,000	1947 1919	M. & N. M. & N. M. & N.	*125	127½ 127	New Orleans La.  Date of Quotation—Mar 5, 1900  Canal & Claiborne RR cons mig. 6s. Crescent City RR lei mig. 6s. Orescent City RR lei mig. 6s. New Orleans City RR lei mig. 6s. IN. Orl's City & Lake RR 1st mig. 5. N. Orleans & Carrollton RR. 2d mig. g. 5s. N. Orleans Railroad Co Cons mig. 6s.	\$150,000 5,000,000 416,500 5,000,000 850,000 800,000	8,000,000 899,000 2,599,500	1899 1948 1908 1948 1907	M. & N. J. & J. J. & D. J. & J. F. & A.	105¼ 108 112	112 118
Interest guar, by Albany Ry. Co. [Principal and interest guar, by Albany Ry. Co.					230/2		18t. Charles St. RR. Co 1st. mtg. 6s. †8428,500 in secrew to retire New Orleans Oity RR. Co.'s 1st mtg. bonds. †890,000 outstanding.  New York	800,000		1906			
Date of Quotation- Mar 5 1100	00 000 000	10 000 000			100	1001	Date of Quotation—Mar 5, 1900	1,500,000	1,500,000			95	
Juited Electric Ry. Colst mtg g. 4s.  Balitimore City Pass. Rylst mtg. g. 5s. Balitimore Trac. Co. Exten. & Imp. g. 6s. Balitimore Trac. Co. Exten. & Imp. g. 6s. Balitimore Trac. Co. Exten. & Imp. g. 6s. Bal. Trac. Co. Ooll. Trust.lst mtg. g. 5s. Balitimore Traction Co. Convertible 5s. Balitimore Traction Co. Convertible 5s. Central Pass. Ry. Co	38,000,000 14,000,000 2,000,000 1,500,000 1,250,000 750,000 800,000 96,000 604,000 8,000,000 1,000,000	1,250,000 1,750,000 117,000	1949 1911 1929 1901 1942 1900 1906 1912 1982	J & D. M. & N. M. & N. M. & S. J. & D. J. & J. N. & M. J. & J. J. & J. J. & J. J. & J.	102 7484 11876 119 10436 121 101 10236 119 116 117	102¼ 75 120  121¼  121 117	Atlantic Av. (Brooklyn). latgen. mtg.5s. tAtlantic Av. (Brooklyn). Cons. mtg. 5s. IBro'dway & 7th Ave. 1st cons. mtg. 5s. IBro'dway & 7th Ave. 1st mtg. 5s. Broadway & 7th Ave. 2d mtg. 5s. Broadway Surface. 1st mtg. 5s. Broadway Surface. 2d mtg. 5s. Brooklyn City RR. Co. 1st cons. mtg. 5s. Brooklyn City & Newtown. 1st mtg. 5s. Brooklyn City & Newtown. 1st mtg. 5s. \$Brooklyn Heights RR. 1st. mtg. 5s. Brooklyn Heights RR. 1st. mtg. 5s. Brooklyn Q'g Co. & Sub'n. 1st mtg. 5s. Brooklyn, Q'g Co. & Sub'n. 1st mtg. 5s. Brooklyn, Q'g Co. & Sub'n. 1st mtg. 5s.	1,500,000 500,000 1,125,000 1,000,000 6,000,000 2,000,000 1,000,000 250,000 8,500,000	1,966,000 7,650,000 1,500,000 500,000 1,125,000 1,000,000 6,000,000 2,000,000 448,000 250,000 8,500,000	1981 1948 1904 1914 1924 1905 1941 1989 1988 1941 1941	J. & D. J. & D. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J.	107½ 115 128 104 108 115 105 116 116 115 101 104 112	110 116 125 105 110 117 106 117 116
All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electic Company.  Boston, Mass.							Brooklyn, Q's Co. & Sub'nIst cons. 5s. Brooklyn Rapid Transit	4,500.000 7,000.000 700,000 1,200,000 250,000 800,000		1945 1900 1902 1922 1908		107 109% 101% 107 125 101	108 109 108 120
Date of Quotation—Mar 5, 1900 Lynn & Boston RBlst mig. g. 5s. West End Street RyDeben. g. 5s. West End Street RyDeben. g. 4%s. †81,674,000 in escrow to retire outstanding bonds of absorbed companies.  Charleston S. C.	8,000,000 2,000,000	8,702,000 8,000,000 2,000,000	1902	J. & D. M.& N. M. & S.	114 104% 112	115 106	2D. Dock, E. Bd'y & Bat'y R. gen.mtg. g. 5e Dry Dock, E. Bd'y & Bat'y RRscrip 5%, Eighth Av. RR. Co Ocrt. indebt. 6 %, 42d St., Man. & St. N. ch. Avlat mtg. 6s. 42d St., Man. & St. N. Av2d mtg. inc. 6s. Lex. Ave. & Pav. Ferry RR. lst mtg. g.5s. Metropolitan St Ry Cog. m. cl. tr. g. 5e Second Avenue RyGen. cons. mtg. 5s. Second Avenue Ry	100,000 000 000 ,200,000 1,500,000 5,000,000 12,500,000 1,600,000	1,100,000 1,000,000 1,200,000 1,500,000 5,000,000 1°,500,000 1,600,000 800,000	1914 1914 1910 1915 1998 1997 1909	F. & A. F. & A. M. & S. J. & J. M. & S. F. & A. M. & N. J. & J.	102 108 116% 89 124 120 120 178%	105 117 125 121 109
Bate of Quotation— Mar 51 00.  Enterprise Street RR	500,000 850,000	47,000		J. & J. J. & J.	106	::::	South Ferry RR. Co	350,000 5,000,000	850,000 5,000,000 150,000	1919 1987 1909 1906	J. & J. J. & J. J. & J.	116 110%	117 112 128
Chicago III.							Union (Huckleberry) Rylst mtg. 5s. tt Westchester Electric RRlst mtg. 5s. †\$1,085,000 in escrow to retire gen. mtg.	500,000	2,000,000 500,000		F. & A J. & J.	118 110	116
Ohicago City Ry	400,000 1,000,000 7,500,000 1,500,000 1,500,000 15,000,000 8,171,000 500,000 500,000 4,100,000 4,100,000 12,500,000	7,500,000 7,500,000 750,000 4,040,000 8,781,200 15,000,000 8,171,000	1908 1929 1929 1907 1982 1928 1942 1906 1911 1900 1927 1928 1911	F. & A. J. & D. A. & O. J. & J. J. & J. J. & J. J. & J. J. & J. M. & N. J. & N. J. & J.	1013/4  108/4  96 106  108	21/4 102  109  96/4  111 102 107	bonds.  184,850,000 in escrow to retire maturing obligations.  §8552,000 in escrow to retire lst and 2d mig. bonds.  2In treasury, \$80,000.  TOPONTO Canada.  Date of Quotation—Mar 5, 1400  Montreal St. By	2,500,000 4,550,000	800,000 2,200,000	1908 1921	M. & S. M & S.		****
†Redeemable at option on 60 da. notice. Funded debt assumed by Ohicago W. Ny. Ry. Co., controlling interest of thich is owned by W. Chicago St. RR. Jo., lessee.  Subject to call after Oct. 1, 1899, at 110 and interest. JASSUMED by W. Chi. RR. Co., lessee. JInt. guar. by W. Chicago St. RR. Co. Cincinnati, O.  Date of Quotation—Mar 5, 1500.							Date of Quotation Mar 5, 1500  Continental Pass. Ry	800,000 100,000 150,000 500,000 5,698,210 200,000 1,300,000 1,300,000	810,000 200,000 100,000 458,000 867,000 1,018,000 1,000,000	1898 1901 1905 1911 1912 1948 1910 1917 1908	J. & J. J. & J. M. & S. J. & . F. & A.		
Mn. New. & Cov. St. Ry. lst Con. mtg. g. 5s Mt. Adams & Eden P'k In lst mtg. 6s. Mt. Adams & Eden P'k In lst mtg. 6s. Mt. Adams & Eden P'k Inc. Cons. mtg. 6s. Mt. Adams & Eden P'k Inc. Cons. mtg. 5s fo. Cov. & Cin. St. Ry. lst mtg. 6s. † Assumed by the Cincin. St. Ry. Co. [\$250,000 reserved to retire 1st mtg. bds.	100,000 581,090 250,000 400,000	100,000 581,000 250,000	1900 1900 1900	J. & J. A. & O. A. & O. M. & S. M. & S. J. & J.	118% 108% 1 4 10834 12136 18234	114% 104  122% 187	¿Union Traction Co	250,000 750,000	29,724,876	1945	A. & O.		
Cleveland, O.  Date of Quotation- Mar 5 1900  aBrooklyn Street RB. Colst mtg. 6s. Din. New't & Cov. St. Ry. Cons. mtg. 5s. Dieveland City Cable Rylst. mtg. 5s. Cleveland Electric Ry. Co. 1st mtg. g. 5s. Columbus (O.) Cent. Rylst mtg. g. 5s. Rast Cleveland RRlst mtg. 5s. Ft. Wayne (Ind.) Elec. Ry. 1st mtg. 5s. Ft. Wayne (O.) Street Rylst mtg. 6s. Lorain (O.) Street Rylst mtg. 5s. Bt. Ry. Co., Grand Bapids 1st mtg. 5s.	8,000,000 2,000,000 8,500,000 1,500,000 1,000,000	2,500,000 2,000,000 1,249,000 1,500,000 1,000,000	1922 1909 1918 1918 1910 1922 1918	J. & J. M. & S. M. & N. M. & S. M. & N. J. & J.	106½ 118½ 105½ 106	107 1145 106 107 1071/2	"Date of Quotation—Mar 5, 1900  Birmingham, Knox & Allentown	875,000 1,250,000 1,500,000 50,000 1,250,000 750,000 250,000	500,060 875,000 1,250,000 50,000 1,250,000 750,000 250,000 750,000	1980 1927 1930 1918 1942 1928 1924	M. & S. J. & J. A. & O. J. & J. J. & J. J. & J. M. & N. J. & J. A. & O. M. & N.	110	118
#81,900,000 in escrow to retire bonds of absorbed companies, marked a, finierest guar. by Cons. St. Ry. Co. DetPoit, Mich. Date of Quotation—Mar. 5, 100	300,000	600,000	1913	J. & D.			Pittsburg & Birmingham	2,500,000	1,500,000 500,000 1,400,000 2,000,000 500,000	11980	J. & J. A. & O. J. & D. V. & S.		* 14
Detroit Citizens' St. Ry	400,000	8,885,000 877,000 1,800,000	1902	A. & O. A. & O. J.&D.	105	102%	Providence R. I.  Date of Quotation—Mar 5, 1900  Newport Street RyOupon 5e United Trac. & Elec. Colst mtg. g. 5e  St. Louis.	50,000 9,000,000	50,000 8,260,000	1910 1988	J. & D. M. & S.	116	111
New Haven Conn.  *Date of Quotation- Mar 5 1100  New Haven St. Ry1st mtg. g. 5s. New Haven (Edgewood Div.) 1st.mtg.5s. Winchester Avenue RR—1st mtg. g. 5s. Winhester Avenue RRDeben. g. 5s.	250,000 100,000	500,000	1914 1912	J&D M&N M&S	111 111 109		Date of Quotation—Mar 5, 1900  Baden & St. Louis RRlst intg. 5s. Cass Ave. & Fair Gds Rylst mtg. 5s. Citizens' Railway Colst mtg. 5s. Oomp. Hts. Un. De. & Mer. Terlst	1.600.000	250,000 1,600,000 1,500,000 000 000	1912 1907		100 2 109 117	100 100 100 110

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#### PASSENGER RAILWAY. Interest periods. Issued. RAME. Authorized. BIL. Asked. St. Louis. Date of Quotation - Mar 5, 1100 1905 M, & N. 1911 F, & A. 1916 M, & S. 1910 A, & O. 1902 J, & D. 1902 J, & J. 1905 J, & J. 1900 M, & N. 1921 F, & A. 105 103 106 102 400,000 400,000 1,500.000 700,000 800,000 400,000 1,500,000 1,000,000 400,000 125,000 75,000 105 100 800,000 | 1910 | A. & O. | 125,000 | 1902 | J. & D. | 75,000 | 1902 | M. & N. | 800,000 | 1904 | J. & J. | 1,400,000 | 1905 | M. & N. | 800,000 | 1909 | M. & N. | 500,000 | 1909 | M. & N. | 1,991,000 | 1918 | J. & J. | 1,787,000 | 1918 | J. & J. | 1,000,000 100 101 100 × 75,000 2,000,000 2,000,000 99 × 108 800,000 500,000 mig. 38600,000 in escrow. 11\$200,000 in escrow to retire 1st mig San Francisco Cal. 117 117 95 900,000 | 1915 | J. & J. 650,000 | 1914 | M. & S. 671,000 | 1921 | A. & O. 8,000,000 | 1918 | J. & J. 1,000,000 114 650,000 1,000,000 8,000,000 200,000 1264 8,000,000 1918 A.& J. 850,000 1912 J.& J. 250 000 1914 J. & J. 700,000 1912 M.& S. 900,000 1918 M.& N. 2,000,000 850,000 250,000 2,000,000 126 × 105 × 115 107 125 Washington D.C. 500,000 500,000 200,000 500,000 450,000 500,000 200,000 500,000 • • • • 182 Miscellaneous. Date of Quotation-Mar 5, 1900 1.688,000 1928 J. & J. & J. 8,543,000 1931 F. & A. M. & N. 2,866,000 1932 M. & N. 2,261,000 1932 J. & J. 18,965,000 1932 J. & J. 18,905,000 1933 J. & D. 922,000 1933 J. & D. 922,000 1933 A. & O. 4,981,000 1930 J. & J. & J. 6,950,000 1930 J. & J. & J. 6,950,000 1932 J. & J. & J. 6,950,000 1928 J. & J. & J. 6,950,000 1928 J. & J. & J. 6,950,000 1928 J. & J. & J. 6,950,000 1928 J. & J. & J. 6,950,000 1928 J. & J. & J. 6,950,000 1928 J. & J. & J. 6,950,000 1931 J. & D. 6,950,000 19 2,000,000 5,000,000 4,000,000 8,000,000 15,000,000 4,000,000 4,000,000 6,000,000 5,000,000 500,000 500,000 1,250,000 8,000,000 108 110 118 105 118 1118/ 1111/4 115 20 80 119 85 1191/ 1101/4 110½ 108 ••••• 4,298,000 1987 1,000,000 1900 105 } 108 106 1,000,000 781,000,000 in escrow to retire 1st and d mtg. bds. 1\$800,000 in treasury. Bonds guar. by Buffalo Ry. Co. 1\$760,000 in escrow to retire bonds of C. St. BR. Co. 1\$87,000 in treasury. 1\$950,000 res'ved to redeem prior liens. With intres ELEOTRIO LIGHT AND ELEOTRIOAL MFG. 008 Roston, Mass. Dalaware Gas Lt. Co., .....lst m. 5s, g. Edison clee. Illuminating Oo., Bostoin... General Electric Co..gold coup, deb. 5s... 800,003 300,000 Quar. 167 116 .... 2,026,000 1922 8,750,000 Pittsburg To Date of Quotation Mar 5 1900 1911 J. & J. M. & S. 110 ..... 1 Miscellaneous.-(Mar 5, 1900.) Il Miscellaneous.—(Mar 5, 1900.) dison El. Ilig. Oo. (N. York) lst m. 5e.. Edison Elec. Ilig. Oo. (N. Y.) con. m. g. 5e. Edison Elec. Ilig. Oo. (Brooklyn)..... Edison Electric Light (Philadelphia)... Edings Oo. El. Lt. & Pow. Oo. lst mtg. 5e. Kings Oo. El. Lt. & Po. Co. pur. money 6s. Milwaukee El. Ry & Lt. Co. lst con. g. 5s. United Elec. Light & Power Co(N. Y.)... 109 124 1223 4,812,000 2,188,000 5,000,000 124 A. & O. 2,500,000 5,175,000 103 122 1997 100 120 1997 6,103,000 1023 TELEGRAPH. TELEPHONE AND Miscellaneous. Date of Quotation-Mar 5 1900 100% 101 F. & A 1908 114 108 115 106 .... 1911 J. & D. ALLIED INDUSTRIES. Miscellaneous. Date of Quotation-Mar 5, 1'00 600,000 **570 000** 25 107 106

75,000

### NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 152@16c.; Lake, 16@162c.; casting, 152@152c.

The General E'ectric Company has declared a regular quarterly dividend of 11 per cent. payable April 14.

The Worcester (Mass.)) Electric Light Company is preparing to spend \$125,000 for underground conduits this year.

The Philadelphia Traction Company has declared a dividend of \$2 per share, payable April 2 to stock of record March 10.

Three of the electric lines connecting Cincinnati and Dayton have been merged into the Southern Onio Traction Company.

The Manchester (N. H.) Electric Company has notified the secretary of State of an increase in its capital stock from \$600,000 to \$1,000,000.

Directors of the Calumet and Hecla Mining Company have declared a dividend of \$20 per share, payable March 3) to holders of record March 5.

February gross earnings of the Union Traction Company of Chicago were \$520,593, an increase compared with the same month last year of \$36,697.

For February the Metropolitan Street Railway Company of New York City reports gross earnings as \$1,043 984, or \$213,476 more than for February, 1899,

The United Power and Transportation Company of Philadelphia, Pa., has called a payment of \$10 a share; one installment for April 2 and the other for

The South Side Elevated Railroad Company of Chicago, has declared a quarterly dividend of  $\hat{q}$  of one per cent., payable March 30. Books close March 20 and reopen March 31.

An issue of \$35,000,000 bonds to pay for the construction of the tunnel rapid transit work was authorized on the 1st inst. by the Board of Estimate and Apportionment of New York City.

The stockholders of the Hulan River Telephone Company have voted to increase the capital stock from \$2,000,000 to \$3,000,000. The addition will be used gradually for extension.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Buat, 15@ 7; New York Electric Vehicle Transportation, 7@8; New England Transportation, 5@6.

The Washington Traction and Electric Syndicate has offered \$100 a share for control of the Capital Traction Company, which has \$12,000,000 in stock and is the only line outside the consolidation.

The New York Gas and Electric Light, Heat and Power Company has secured control of the Queens Borough Electric Light and Power Company by purchasing \$250,000 of its bonds at d \$255,000 stock.

Stockholders of the Consolidated Traction Company of Pittsburg, Pa., will hold a special meeting March 31 to vote on the proposition to lease its property and franchises to the new Union Traction Company.

The Western Union Telegraph Company has completed the purchase of the lines of the Descret Telegraph Company, heretofore owned by the Mormon church. The wires extend throughout  $U_1ah$  and into Idaho and Nevada.

First consolidated 4s and income 4s of the United Railway and Electric Company of Baltimore and \$500,000 capital stock of the New Haven Iron and Sceel Company have been regularly listed on the Philadelphia Stock Exchange.

The United Gas & Electric Company of Syracuse, N. Y., was incorporated at Albany last week with a capital of \$4,000,000 to manufacture gas and electricity. The capital stock is divided into \$1,000,000 preferred and \$3,000,000 common stock.

A bill giving to the New York Gas, Electric Light, Heat & Power Company privilege to lay electric subways similar to those now owned by the New sterdam Gas Company has been advanced to the third reading in the Legislature the privilege to at Albany.

A deed from the Kane's Falls Electric Company to the Hudson River Water Power Company for \$2,365,000, for lands, rights of way and water power in Corinth, Morean, Luzerne and Queensburg has been recorded in the office of the clerk of Saratoga County, N. Y.

The Raritan Traction Company, with a capital of \$1,000.000, has been incorporated and the papers filed at the County Clerk's office in New Brunswick, N. J. The company will operate the trolley road which is being constructed at Perth Amboy. The Lewissonns, who run the Raritan copper works are said to be behind the corporation.

Brown Brothers of New Yerk City have made a cash distribution of 33\} per cent. from the proceeds of the sale of the new securities, which were issued by the St. Louis Railway syndicate to take the place of the securities of the different companies absorbed. This makes the second distribution, 15 per cent. having been read companies. paid some time ago.

Officials of the Chicago Union Traction Company, controlled by the Whitney-Elkins syndicate, and of the Chicago Consolidated Traction, owned by Charles T, Yerkes and his associates, met in this city on the 5th inst. for the purpose it was reported, of closing up the deal for the amalgamation of the two corporations. Nothing definite could be ascertained as to the outcome of the meeting, beyond a report that the arrangements were proceeding satisfactorily.

The Edison Electric Illuminating Company recorded on March 1 a mortgage for \$15,000,000, made in f4vor of the State Trust Company. The mortgage was originally recorded in 1895. It is supposed that the document was recorded a second time, owing to some technicality. There was also filed with the Secretary of State at Albany on the same date certificates of merger of the Manhatan Electric Light Company, capital \$1,500,000, and of the Harlen Lighting Company, capital \$250,000, with the Elison Electric Illuminating Company of New York City. The Edison Company some time ago was practically absorbed by the New York Gas, Electric Light, Heat and Power Company.

The Grand Jury of New York will investigate the wrecking of the Third Avenue road, and in the meantime the temporary receiver, ex-Mayor Hugh J. Grant, has decided upon a plan whereby holders of the stock will be assessed from 50 to 66% per cent. on their stock in order that the present pressing financial needs of the road may be relieved. Ultimately 5 per cent. notes will be issued at a discount of 10 per cent. to the full extent of the indebtedness. Receiver Grant said yeterday: "I expect to be able to present my final schedules dealing with the affairs of the road to Judge Lacombe on March 14. These schedules will set forth in detail my plans for reorganization. It is not my business to investigate or prosecute politicians or others who are charged with having wrecked the road. My duty is to bring order out of chaos and to endeavor to place the Third Avenue road on a sound financial basis again." There are liens on the road for \$6,000,000, two electrical companies having claims for large amounts. At 1 o'clock yesterday the stock was quoted at 55, and one year ago the shares were worth 245.

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No. 10

# LECTRICITY

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Entered at the New York Post Office as seen

THE TRADE SUPPLIED BY THE AMERICAN NEWS COMPANY.

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### EDITORIAL NOTES.

Again the New York Stock Exchange.

Frequently in these columns we have referred to the lax methods which have prevailed on the New York Stock Ex-

change regarding the listing of undesirable securities as well as to the annual reports issued in the past by industrial corporations, and which have often been nothing more nor less than a clever jugglery of figures.

Our warning as well as that of other leading papers was ignored with the result that the investing public has been made to suffer through the manipulation by unscrupulous speculators of the stock of the Brooklyn Rapid Transit Company, and still more recently of that of the Third Avenue Railroad Company. In answer to the query, "When shall Wall Street be treated to the unusual sight of seeing honesty in high places?" the financial writer of one of the daily papers takes practically the same view of the situation that we always have, and says:

"The Stock Exchange itself is largely responsible for this condition of affairs. The compulsory filing of reports by all of the corporations whose shares are dealt in openly upon the floor of the Exchange, would mitigate to some degree the prevailing evil. The gambling element seems to make the rules of the Exchange. The admission of any and every class of security to the unlisted department, where stocks are dealt in about which the members are quite as much in the dark as the public, is steadily becoming more of a public scandal.

"Publicity concerning the statements of earnings, balances and outstanding securities does not always remedy an ill, as is shown by the disclosures in the case of the Third Avenue Railroad. Here was a company whose stock was regularly listed and which made reports not only to the Stock Exchange, but also to the State officials. The wreckage, of this once gilt-edged corporation, whose credit was as good, if not better, than most similar companies, is now floating in and out of the brokers' office. It is becoming a serious question to Wall Street as to when these cases of financial trickery shall cease. First it was the American Tobacco Company which shamefully manipulated its dividend, then a number of similar organized 'specialties' deliberately "thimble-rigged" the speculative public,

and in the meantime Third Avenue stock became a football because even the stringent rules concerning the reports which must be made by regularly listed corporations were violated. It is safe to say that in no great financial center of any nation on the globe would such shameful manipulation of corporations and securities be permitted."

That such is the case there is little doubt, and it is to be hoped that the Board of Governors of the New York Stock Exchange, now that a crash has come, will awake like Rip Van Winkle and fully realize the responsibility that devolves on them and their duty to the public.

Carbons Dutiable at 35 Per Cent.

On November 9, 1897, Twenty-four Inch and January 17, 1898, carbons were received through the Custom House at New York by

two importing firms upon which the Collector assessed duty at 90 cents per hundred, under the provisions of paragraph 98 of the present tariff act. The merchandise in question consisted of sticks or rods of carbon, each 24 inches in length, and in the assessment of duty the Collector mentally divided each carbon into a length of twelve inches, and assessed duty upon each twelve inches. The importers entered protest upon the plea that they should have been more correctly classified under the provisions of paragraph 97 of the same act in which it is provided that "articles and wares composed of . . . carbon, not specially provided for . . . if not decorated in any provided for . way" shall be dutiable at 35 per centum ad valorem.

From the testimony offered it was found by the Board of General Appraisers that the rods of carbon in question were identical with those covered by a previous decison of the Board in re Downing, which decision was reversed by the Circuit Court for the Southern District of New York, and was afterwards affirmed by the Circuit Court of Appeals for the Second Circuit, the latter court agreeing with the finding of the Board that the carbons were ultimately intended for use in electric lighting, but to make them suitable for that purpose it was necessary that they should be first cut into proper lengths, after which the ends must be pointed or ground before they could be used for the purpose named. It was therefore held that they were dutiable under said paragraph 97, under the provision above

quoted, and not as finished carbons suitable for electric lighting.

Following this decision the Board sustained the claim made by the importers that the carbons were dutiable at 35 per centum ad valorem, under said paragraph 97, and reversed the decision of the Collector, at the same time giving instructions that the entries should be reliquidated in accordance with the decision just quoted.

\* \* \*

"The Ships that Pass in the Night." When wireless telegraphy was first brought to the attention of the public, the consensus of opinion seemed to be that this

method of transmitting messages would never amount to much in a commercial way and that its field of usefulness would be extremely limited. Such has not, however, been the case, owing in a great measure to the indefatigable work and untiring efforts of William Marconi. Besides being made use of as a means of communication between light ships and the mainland the wireless telegraphy system has been tried with success for signaling purposes between men-of-war, and still more recently it has been demonstrated in the Transvaal that this method of transmitting messages has much to recommend it for sending dispatches from one army corps to another during an active campaign.

The latest application however of this new method of telegraphy is in the merchant marine. The Kaiser Wilhelm der Grosse of the North German Lloyd line, which arrived in New York from Bremen recently, had on board a Marconi transmitter and receiver, by means of which intelligible signals were transmitted to the mainland on the departure of the steamer from the other side. The messages were sent from the liner to a receiving station off the North German coast fifty miles distant and were communicated over cable and land wires to Bremerhaven, the port of Bremen, ninety miles away.

Ever since Marconi demonstrated the practicability of his system, officials of the North German Lloyd line have been desirous of applying it to one of their liners. With this end in view permission was obtained from the German Government for the erection of a station on the Borkum lightship, but owing to an accident the lightship had to be abandoned as a receiving and transmitting station and Borkum Island at the mouth of the Ems was substituted.

When the Kaiser Wilhelm der Grosse, which left Bremen on February 28, was fifty miles from the receiving station messages concerning the vessel's movements were sent from her. In charge of the operating room on the ship was one of Marconi's assistants. While it was evident that the messages had been received at the station, no replies were received aboard the ship until she got within thirty-five miles of the island.

This was accounted for in the difference of height of the masts on the vessel and on the island. The mast at the station was 185 feet high, while that on the vessel was only 135 feet. From messages received on the ship it was learned that there was communication by the wireless system from the liner to the station when fifty miles distant. Greetings between the two continued until the Kaiser was beyond signaling distance.

The success of this experiment has led many to believe that the officials of the North German

Lloyd line will in the near future have all their ships equipped with the wireless system. If this is done it is suggested that the Nantucket South Shoal lightship be made a receiving station, which would enable news of the approach of a vessel being received in New York City some fifteen hours before her arrival. Another use which might advantageously be made of the Marconi system, were all the principal transatlantic liners to adopt it, would be in signaling passing ships at night. As is well known the steamships of the merchant marine have no international system of night signaling, and in view of this fact the wireless system would seem admirably adapted to this purpose.

### Electric Light Rays as a Curative Agent.

Some time ago the scientific world was more or less startled by the announcement that a Danish

professor, by working on the principle laid down years ago by Prof. Widmark, had succeeded in curing various ailments by means of light emanating either from the sun or an arc lamp. This method of treatment is known as phototherapy, and in a word consists in subjecting the diseased part to ultra-violet light rays. In an excellent article on this subject, which recently appeared in the N. Y. "Journal," the light treatment, as applied to cancer, is referred to as follows:

"The principle of phototheraphy is that the germs of cancer are unable to live after the onslaught of a tremendously strong light. By means of a special contrivance sunlight may readily be used for the purpose. To obtain sufficient light artificially a 22,000 candle-power arc lamp is used. The light is deflected into a three-foot telescope arrangement to intensify and concentrate it, exactly on the principle of a burning-glass. But in order to prevent burning of the flesh and scorching of the skin it is necessary to rob the white light of the heat rays, leaving only the light rays to pass.

"This is done by substituting quartz lenses, which intercept heat rays, in the telescope for ordinary glass lenses. The light rays are then cooled still more by passage through clear cold water. A device clamped to the patient's face and connected by a tube to the telescope assures that, despite movement of the patient, the light will be projected on the exact spot to be treated. This spot measures a surface from \(\frac{1}{2}\) to \(\frac{1}{2}\) of an inch square. As each afflicted spot must be treated, and as each spot requires one hour's steady application, the treatment is a rather tedious one. It is not painful."

That sunlight is almost as necessary a sustenance to human life as food has long been known, and in many cases, especially in those ailments pertaining to children, doctors have for years recommended sun baths. It was not known, however, until Prof. Finsen took up the study of this subject in a scientific manner that some of the colors of the spectrum were fatal to certain forms of microbes and bacteria. As regards the application of Dr. Finsen's process to that dreaded disease known as cancer, although learned doctors agree to disagree as to whether it is due to a specific microbe, bacillus or germ, it is claimed that surface cancers have been cured by the light rays, which in itself is a great triumph of science.

Probably the first Finsen phototheraphic machine to be introduced into this country has recently been installed at the St. John's Hos-

pital in Brooklyn. With this apparatus careful and exhaustive experiments are being made which, providing they prove successful, will do much toward alleviating human suffering and immortalizing the name of Finsen.

### UNDER THE SEARCHLIGHT.

### Notes and Comments on Various Topics.

ELECTRICAL contractors are complaining of the scarcity of electrical workers in Pittsburg at the present time. There is a demand for about 100 additional electricians and the unusual lack of workers will be made a sutject of action at the meeting of the Electrical Contractors' Association to be held on Friday.

The entire Chicago suburban train service of the Pennsylvania Railroad probably will be abandoned. Local officers have recommended to the management in Pittsburg that all of the trains, with the exception of one in each direction, morning and evening, be discontinued as soon as practicable. Trolley competion is the principal cause of the action.

The "Electrical Engineer," London, is au thority for the statement that the introduction of the metric system of weights and measures in Russia is likely to take place before long, as a scheme to that end, prepared by the Ministry of Finance, has already received the approval of the Council of State on the condition that it should be supplemented by a scheme for organizing the aid which different scientific societies and the universities are ready to render in the verification of the new weights and measures for commerce. This latter scheme is nearly ready and will shortly be brought before the Council of State.

With a deafening noise that shook the buildings in the neighborhood, a compressed air tank in one of the 29th street cross-town air cars of the Metropolitan Street Railway Company of this city, that had apparently been overcharged, burst a few mornings ago in the car sheds in Twelfth avenue, between 23d and 24th streets. Three men were badly injured and half a dozen other employes were more or less cut by broken glass. The car was completely demolished. So much for compressed air as a motive power for street cars.

An exposition of automobiles is to be opened in Mexico by an American who is now in New York arranging for the shipment of a large number of automobiles of different systems. A French paper, commenting upon this fact, says: "It is in France that the automobile industry has shown the greatest development. Nevertheless, here are the Americans who are outstripping us and virtually cutting the grass from under the feet of the French manufacturers."

In a recent issue our worthy contemporary the "Electrical World and Engineer," commenting on the efforts that are being made to reduce telephone rates in New York to a reasonable figure, said: "More than one newspaper in New York City is still carrying on an agitation for lower telephone rates. Intrinsically, there can be no objection to that any more than there can be to an agitation for lower prices at the opera, for cheaper ice, cheaper coal or other convenience or commodity. We all want things cheaper, Heaven for some



divine purpose implanted that desire in the breast of mankind just as it did the other desire to derive all the income that the traffic can stand. As between these opposed tendencies the happy mean is usually found, but it certainly is not discovered by all who are hammering away at this telephone question. The assumptions and arguments as to the low rates at which telephone service can be given are positively absurd and ridiculous, and even when accurate bear no relation to the point at issue." To any one who is acquainted with the situation, it is only natural that the "Electrical World and Engineer," which forms a part of what might be termed a small electrical newspaper monopoly, in that it as well as several other periodicals are under the control of one well-known gentleman, should seek to uphold and sustain another monopoly, namely, the New York Telephone Company in its depredations on the public.

ELECTRICITY will take the place of steam as the motive power for rope-making in the Charlestown Navy Yard this week. It is the first time electricity has been utilized for power in such work, and the operation of the plant will be watched with interest. The necessity for the change and increasing facilities of the ropewalk was demonstrated in the Spanish war. This is the only rope plant owned by the Government, and the greater part of the rope used in the service is made there.

Mr. E. B. Baldwin, who has recently returned with the Wellman polar expedition, is firmly convinced that it is possible to utilize the great electrical energy of the Aurora Borealis. Observations he made in the Arctic regions convince him that there are great electrical currents passing through the earth from the north to the south pole which might possibly be utilized for many purposes.

The new invention for dispensing with telephone girls and substituting automatic apparatus, thus placing subscribers in communication without an intermediary, was tested last week in Paris, France, by the Minister and the telephone officials, who were delighted with the results.

ELECTRICITY is soon to be put to a novel use by Anton Schultheis, a florist of College Point, L. I., who will try the power of electric light to hasten the blooming of flowers. He devotes much attention to chrysanthemums and carnations and believes that if his greenhouses are brightly illuminated during the night his plants will flower in at least half the usual time they require. He has closed a contract with the New York and Queens Electric Light Company to have electric lights in large numbers put in all of his greenhouses.

WORK upon the electric railroad which is to connect the city of Lerdo, Durango, with the flourishing town of Torreon, Coahuila, has been begun.

According to a cable dispatch from Paris, France, the Bois de Boulogne and Vincennes are to be lighted by electricity. Thus ends a long struggle in the Municipal Council. The work will begin immediately upon the voting of the necessary grants. As far as the Bois de Boulogne is concerned the work will be divided into three divisions. They will commence first by the installation of the 110 incandescent lamps to light the Allée des Fortifications in

the part going from the Porte Dauphine to the Porte Maillot and across the Bois as far as the Pont de Suresnes by the Allèe de Longchamp, part of the Route des Tribunes, and of the Route de Suresnes. The two other divisions will include the Allées du Tour du Lac, the Route de Saint-Cloud, the Ronde de la Muette at Neuilly, and the Route des Lacs, at Passy, and the lighting by electricity of the Avenue de l'Hippodrome and part of Avenue de la Reine Marguerite.

Under a recent decision of the Governor of Natal it is provided that a rebate shall be allowed equal in amount to the total duty levied on all importations of battery cloth, gauze, matting, sieving and screening; crucibles, electric cable, or wire and posts for same and their fittings; electric lamp posts and their fittings; electric lamps and switches, not including ornamental or fancy lamps, also fittings for indoor lighting.

According to "Indian Engineering," there will shortly be a trolley line "On the Road to Mandalay." A scheme recently submitted by the Burma Electric Works Syndicate, was accepted by the Mandalay Municipal Committee with the result that a trolley road will be commenced within one year, to be in running order in three years.

PREPARATIONS are now being made for the trial of an electric third rail on the New York, New Haven & Hartford Railroad for heavy traction. The principal points of the system are that the rail is not charged with electricity after a train has passed over it and that enough power can be obtained to propel heavy trains as well as the single trolley cars, for which speed is more necessary than power. The third rails which have thus far been used are "alive," or charged with electricity at all times. The legislators of Connecticut, while trying to help electrical development, have frequently protested against the "live" third rail as a menace to life.

The Senate Committee on Naval Affairs has ordered a favorable report upon the bill to construct a cable to Manila by way of Honolulu, Midway Islands and Guam. It is to be under the direction of the Navy Department and to be a Government cable. Senator Hale, the chairman of the committee, was authorized to prepare a bill and report it to the Senate. It will provide for immediate construction of the cable only from San Francisco to Honolulu, but it contemplates the ultimate extension of the cable to the Philippines and also to Hongkong. It is estimated that the cable to Honolulu will cost between \$3,000,000 and \$4,000,000.

A PATENT has been issued for a new electrical advertising device. It is proposed to sink in the pavement a glass disk to be lighted at night from below.

In a recent issue of ELECTRICITY it was announced that a resident of Pittsburg, Pa., had invented a magnetic switch to be used on trolley roads. The apparatus, which is now being given a trial on one of the roads in that locality, consists of an arrangement of electromagnets by means of which a motorman controls the switch from his position on the car. The power used for throwing the switch taken from the trolley wire at a given point

from the switch. The car is stopped about thirty feet from the switch, and this brings the trolley wheel at the top of the car's trolley pole in connection with a small wire that runs to the magnets that are enclosed in an iron box on one of the side poles on the curb line of the street. The movement of the magnets works the rods that run under the pavement to the switch, and by means of the controller the motorman is able to throw the switch tongue in either direction.

THE Susquehanna Electric Power Company has so far matured its plans that within a comparatively short time the city of Baltimore may get its electricity for lighting and power from the falls of the Susquehanna River. The necessary real estate has been secured and the company, with \$7,000,000 capital, has been formed. It is proposed to build two power houses, each capable of producing 40,000 electrical horse power at the normal flow of the river. The general plan of the plant will be the same as that at Niagara Falls.

CHICAGO is preparing to use the drainage canal as a source of electrical power. It is thought that the power can be used with profit as a motive power on the canal in much the same way that it is on one or two of the canals in Germany.

THE director of the Bilbao section of the Spanish Telegraph Department, who is called Señor Don Esteban de Urrestarasu y Gutiérrez de Pármo, has invented an apparatus which, it is said, serves for the double purpose of preventing the entanglement of telegraph wires and of cutting the wires which have become entangled. Why the latter should be necessary, says the London "Electrical Engineer." if the apparatus effectually prevents the former, is not quite clear from the meagre details at hand at present. Anyhow, the Spanish Government have decided to institute practical trials with the "nemapiro," as the instrument is called, and further events will be awaited with interest, as an invention of this sort would fill a long-felt want-if it can be made to work properly.

AKRON, Ohio, claims to be the first city to adopt the automobile for use as a police patrol wagon. Henceforth the lawbreakers of that enterprising town will ride to station house and police court in up-to-date style. It is expected also that hurry calls will be answered in half the time formerly required, as the wagon will be kept ready to start on an instant's notice. The vehicle has been in use long enough to indicate its complete success. It is capable of running at the rate of twenty miles an hour on country roads, and its electric batteries will carry it for twenty-five miles without recharging. It is capable of making rapid headway through clay, mud or heavy snow, and answers every requirement of the service for which such a wagon is intended.

ENGELBERT HOHENBERGER, a Bohemian shoemaker residing at Bodenbach, a little town about eighteen miles from Dresden, has invented a walking shoe which is heated by means of an electrical apparatus in the heel, with tubes conveying heat under the surface of the sole. Unherveer, the inventor of the ordinary winter shoe, says that it has been conclusively proved that the new electrical invention gives absolute protection from snow and rain at a cost of 25 florins (\$11).



# THE INSTITUTION OF ELECTRICAL ENGINEERS AND ELECTRICAL STANDARDIZATION.

### [From our London Correspondent.]

The paper by Mr. R. P. Sellon on "The Standardization of an Electrical Engineering Plant," has, on account of the importance of the subject, roused more interest and discussion than any previous paper of the present session. The charges brought by the author, as representing manufacturing interests, against consulting engineers, who he declared were primarily responsible for the lack of standardization in English electric lighting works, led one to anticipate more or less of a pitched battle between the representatives of the two interests, but on the first night of the discussion most of the speakers were from the ranks of manufacturers-in fact only one, and that Mr. Robert Hammond, represented consulting engineers. Doubtless consultants will make use of the opportunity of excusing themselves at the resumed debate.

The reading of the paper was immediately followed by Mr. R. E. B. Crompton, who said that up to the present the manufacturers were the people who had suffered from the vagaries of the consulting engineer in not being allowed to standardize more than they had done. However, no harm resulted, but a great deal would have resulted if standardization had been carried out earlier. Consulting engineers had not varied the standards much in English electric light works, but the great variety of periodicity pressed hardly upon the manufacturers of motors, lamps, etc. Motors should be standardized, because it was only after standardization that the small user could obtain them at the price he was prepared to pay. The smaller sizes \frac{1}{8} and \frac{1}{6} hp. were becoming standardized, and standardization of motors for driving tools in workshops was likely to become general almost at once. Mr. A. B. Blackburn (Electric Construction Company) said tuat each manufacturer must begin at home and standardize his own types, and try to convince the user that he had good reasons for it. They might thus be able to come to a common understanding as to what were the best types of machines. He thought in the supply of alternating current machinery, they were already arriving at something like standardiza-He hoped that engine makers would help electrical engineers in their efforts to obtain standardization. As matters are at present, dynamo makers find considerable diversities of engine speed when drawing up their tenders, and they have to get out tenders for three or four different dynamos to accommodate different types of engines.

Mr. J. Slater Lewis (P. R. Jackson & Co.) thought the subject of standardization ought to be attacked very vigorously by English engineers. He made a few remarks upon the effect thereof upon foreign competition, one of the points raised in Mr. Sellon's paper. He was of the opinion that a committee should be formed to suggest certain sizes of motors and dynamos. His own firm were commencing to standardize motors, and they hoped in a short time to sell standard sizes and nothing else.

Mr. E. Johnson spoke of his experience in America in the standardization of constructional detail. Mr. J. S. Raworth said that standardization of details had a much greater effect upon a station than most people were aware of, even more than periodicity or pressure. Mr. Mark Robinson (Williams & Robinson)

son), speaking as an engine maker, said that attempts made at his own works to standardize had been thoroughly successful since they commenced a few years ago. If the consulting engineer stated whether he wanted high or low speed engines, and left a great deal to the discretion of the manufacturers standardization would be considerably helped. A year or two ago an order came to him for a 1,200 hp. engine. Gauges were at once gotten out so that others could be made similar to it, although it was a very large size then, but the wisdom of this course was soon apparent, for before this one was out of the shop orders had been booked for eighteen more. On the matter of standardization of engine speeds, dynamo-makers had only to ask for what they wanted and the engine-makers would do the best in the matter. Mr. R. Hammond (consulting engineer) said

circuit than on the surrounding ones, this one could use up the dim lamps from the others, but this he said was a selfish policy.

### RECENT NIAGARA POWER INSTALLATION.

BY FRANK C. PERKINS.

Messrs. Pratt & Letchworth have installed in their malleable iron works at Buffalo, N. Y., a complete electric plant for operating their entire works with Niagara power.

A large rotary transformer of the three-phase General Electric type is utilized by supplying power to the countershafting, taking the place of the steam engine previously used, and at the same time it supplies a direct current to the electric cranes and direct current motors in other parts of the works, replacing the direct

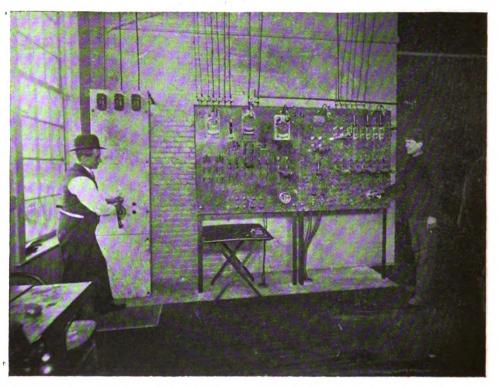


Fig. 1.—High Tension 3-phase A. C. Switchboard and Low Pressure D. C. Switchboard.

that it was necessary to get the best plant and to obtain it as economically as possible. He claimed that consulting engineers were not so black as they were painted. They had to see many types of engines and dynamos, and they advised the user as to the best. The Institution Standardization Committee had fixed the standard periodicity at 50, after which they went on to say that there should be a periodicity of 100 for systems using transformers in people's houses. Mr. Hammond considered that the committee was mistaken in not striking out the 100 periodicity altogether.

Mr. S. Z. de Ferranti expressed regret that Mr. Sellon's paper had not been read 10 or 12 years ago, as to his mind much of the evil of non-standardization had now come to stay. This they could see in the numbers of different periodicities in generating stations all over the country, and also a great many different engine speeds. Once a periodicity was fixed it was very difficult to get an engineer to alter it. Americans started with 120 periods and kept to that standard until not long ago having found that it was too high they halved it, with the result that 60 periods is common to-day. He had heard it argued that standardization of voltage was not the best thing in all cases, because with a slightly higher voltage on one current generators previously used for this purpose.

The high tension alternating static transformers are three in number and are located in a separate room enclosed with brick walls back of the switchboards, as shown in illustration (Fig. 1). The attendant is seen ready to close the high tension circuit at the switchboard at the left. Oil enclosed switches are used and the three-phase current is reduced in pressure from 11,000 volts at the sub-station, where the current is taken from the Niagara lines, to 2,200 volts as it enters the works of Pratt & Letchworth.

- It is again transformed from 2,200 to 170 volts alternating current, and by means of the rotary converter, shown in Fig. 2, a direct current of 250 volts is supplied to the shop motors and electric crane. This machine has a capacity of 800 amperes and also delivers from its pulley 100 hp. to the main shafting from the pulley at the left. The rotary has a speed of 750 revolutions per minute and the frequency is 25 cycles, the total capacity being 250 kw.

Niagara current is now operating the entire street railway system of Buffalo and furnishes power for lighting the entire city with street arc lights and a complete alternating incandescent system for residence and business places through the Cataract Power & Conduit Company and the Buffalo General Electric Company, the former corporation receiving the Niagara current at the city limits and distributing the power entirely for large users, the meters apart, no insulation being used even where they came in contact with the rocks for a few meters at the Grands-Mulets terminal. Having been found to operate satisfactorily with the telegraph instruments they were tested for resistance and insulation. These measurements showed that the insulation was

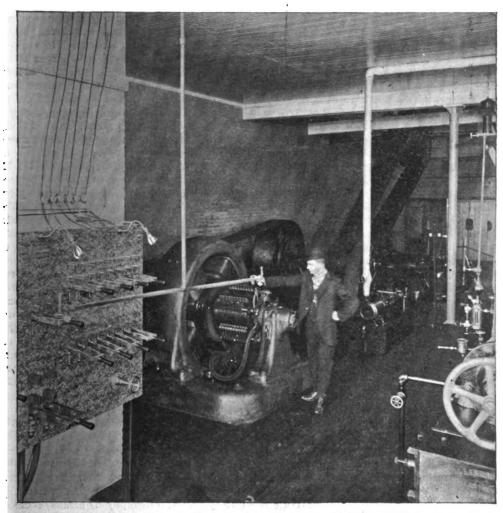


FIG. 2.—THREE-PHASE ROTARY CONVERTER AND MOTOR COMBINED.

latter company furnishing the small users with power through their 500 volt direct current power circuits about the city.

### Telegraph Wires on Glaciers.

In a communication to the French Academy, published in a recent issue of "Comptes Rendus," the veteran astronomer, M. Janssen, gives some interesting information as to the insulating power of glacier ice, as developed in the telegraph work conducted in connection with the Mont Blanc observatory during the past year. These investigations were conducted by MM. Lespieau and Cauro, and the unfortunate feature of the work was the fatal accident to M. Cauro almost at the outset of the experiments.

The undertaking upon which the studies were made consisted of the connection by wire of the summit of the mountain with the Grands-Mulets, and the interesting feature of the experiment was the fact that the naked wires were permitted to lie directly upon the surface of the glacier, without any support or insulation.

The wires used were the regular French Government standard of galvanized iron, 3 millimeters in diameter, and the length of the line was about 1,700 meters, or a little over a mile, this being the distance between the terminals, and hence the length of each half of the circuit. The wires were laid directly upon the surface of the ice, being about 5

almost perfect. Galvanometer deflections on the line at points distant 300, 600 and 1,700 meters from the lower station were practically identical with those at the terminal, and the resistance of the line, as tested by a Wheatstone bridge, was found to lie between 56 and 57 ohms, while with perfect insulation it would have been but 59 to 60 ohms, so the loss was insignificant.

The results of these experiments, while per-

The results of these experiments, while perhaps of limited application, may yet prove of much importance in mountain exploration work, since it is shown that telegraph wires may be laid over the ice in the trail of an exploring or military party with but little labor

or cost.

One point which must not be overlooked in this connection is the influence of cold upon the battery. The resistance varies notably with the temperature, probably due to the reduction in strength of the chlorhydrate of ammonia caused by deposition of the salt. Down to temperatures not lower than 16° C. the electromotive force remains practically constant, after which the solution slowly freezes. When the mass has become solid the temperature continues to fall, and the resistance increases enormously. These points must be taken into account, especially in connection with electrical measurements made at low temperatures.

In view of the fact that the surface of a glacier is always in slow motion the permanency of a telegraph line laid upon the surface of the ice cannot be insured. M. Janssen promises some future data upon this point, which must necessarily involve observations made over a considerable period of time, but as such lines will probably be laid only for temporary purposes, this is not a matter of fundamental importance.—The "Engineering Magazine."

### MICA MINING IN BENGAL, INDIA.\*

### BY A. MERVYN SMITH.

The zone of mica-bearing rocks in Bengal has been worked for centuries by the Hindus. Mica is largely used by them for ornamental purposes, such as inlaid work, tassels, flowers, toys, banners. The large clear plates are much used by native artists for portrait painting as being extremely durable and not affected by heat or dampness, and impervious to the attacks of insects. The waste mica is ground to a coarse powder, and after being mixed with starch is applied to cheap cotton cloths to give them a sheen.

The great marts of mica for native consumption are Patna and Delhi. Dr. P. Breton, who visited these mines in 1826, found as many as 5,000 people at work at different mines. In 1849 Dr. McClelland gives the output as 100,000 maunds (a maund being 82 lbs.). In 1863 the statistical account of Bengal says 10,000 maunds were exported.

The native mines are of the most primitive kind. Open cuts along the outcrops of the pegmatite veins where books of mica are seen in any quantity. These cuts are continued down 20 or 30 feet till the sides become dangerous. No timbering is used to keep the sides from falling in, and frequently accidents happen and the miners are buried beneath the fallen walls of the reef. Where exceptionally rich stuff is met, and the vein-stuff is decomposed and soft to some 50 or 100 feet, inclines are put in, and follow down the rich shoots of mica in a most tortuous course, zig-zagging about from side to side with the leads of rich ground. Long lines of women near to each other and placed in double row, from the water level to surface, hand out earthen pitchers-called "gurrahs"-to one another; the full pitchers are handed up one line and the empties down the other. As many as seventy women are sometimes placed to remove the water from a mine not 35 feet in perpendicular depth. The incline, of course, was much more than this in length.

Where the reef is highly felspathic and of large size, decomposition extends to 100 feet or more, and it is here that their largest mining operations are carried on. In order to ventilate the inclines and draw out the mica, perpendicular shafts about two feet in diameter are put in. The author counted as many as thirty of these circular shafts along the strike of the reef and within a few feet of each other.

The miners are a local tribe called "Bandathis," the men, women and children all working at the time when they have no agricultural work in the fields. Work is only conducted in the dry months (November to May). Immediately the rains set in they return to the tillage of their fields. Work is only conducted in the day, beginning about 8 A. M., and giving over at dusk. Where the veins are hard, yet sufficiently rich to pay for the labor, large fires are kindled against the face of the lode, and when the vein stuff is sufficiently heated, water is thrown on to it, when the sudden cooling causes the rock to shrink and crack. Into these cracks wedges of soft iron, locally manufactured from the magnetite iron ores common in this neighborhood, are driven and large boulders detached. The exposed books of mica are chiseled out and taken to The books of mica are split into surface.

<sup>\*</sup>Abstract of paper read before the Institution of Mining and Metallurgy, London. From the "Australian Mining Standard."



sheets of about one-eighth of an inch in thickness. All the rough edges and flaws are trimmed off by means of a sharp sickle (called "hasawah"), and then sorted according to color and size. The sheets are in some cases very large, 18 inches by 24 inches being the largest in this district. In the Itakuri mine, Nellore district, plates 40 inches by 60 inches have been obtained.

It is only within very recent years that Europeans have taken up the mica industry. Mining is still conducted on purely native methods, described above, and, although 250 mines are at work in this district, on not a single one is machinery of any kind used. The same wasteful, slow and laborious system practiced by the natives for hundreds of years is still in vogue. Men are sent out during the rains to search for likely looking outcrops of mica. The mica schist, being softer than the other members of this series of rock, is eroded into valleys-the more quartzose beds making the ridges of hills. A certain amount of alluvium and talus from the adjacent hills covers the valleys.

After exceptionally heavy rain this surface deposit is washed off, and with it the decomposed felspar of the pegmatite veins, leaving exposed tufts of partially decomposed mica. The natives call these tufts "foo-foo," and believe that they grow during the rains, as they cannot account for their exposure at surface after a heavy shower, where there was nothing apparent before the rain. Having discovered several of these "foo-foo" spots, these are marked off for mining operations as soon as the dry season begins. Parties of men, women and children are set to work on these outcrops, and the books of mica-dug out, packed in loads of about 30 lbs., and brought in at dusk to the central store.

Here several skilled men are seated on the floor trimming the mica before it is packed away for market. Before each man is a stout peg, driven firmly into the ground and protruding about 18 inches. The books of mica are first split into plates about one-eighth of an inch in thickness, the mica easily splitting into laminæ of any thickness. The trimmers are provided with sharp sickles, and the point of this knife is used for opening the sheets. Imperfect laminæ are now peeled off of the plates till both surfaces show a clean, even face. The plate is supported against the side of the peg, and the sickle drawn downwards to trim off the jagged ends and irregularities along the edge of the sheets of mica.

After trimming the plates are sorted for the European market, the United Kingdom and America being the chief buyers. The sheets are first sorted according to quality, four kinds being recognized by the dealers. 1. Ruby mica, hard and tough. 2. White transparent mica. 3. Discolored and smoked. 4. Black mica and flawed.

The sheets are trimmed irregularly into any shape they will take to clear them of flaws. Should square, rectangular or diamond-shape sheets be wanted, a special rate has to be paid for these to allow for the great waste.

The sheets are packed in boxes of 1 cwt. and transported on carts to the nearest railway station, 100 miles distant. From thence it goes to Calcutta and shipped to London or the United States of America.

There cannot be the slightest doubt that when European methods of mining are introduced the cost of production will be materially reduced, the waste will be much less, and a

better quality of mica will be secured. At present only the decomposed, or partially decomposed, vein stuff is mined. Here the mica must also undergo a partial decomposition, but of course not to anything like the extent of the felspar. In the hard vein stuff the mica is hard and tough, and this class of mica commands a better price.

Some of the veins yield black mica (biotite). This is largely used as a drug by Hindus and Mohammedans. Reduced to a powder, it is supposed to be very efficacious in cases of dysentery.

The sheets of mica are at times very queerly marked. In places one-half of each sheet will be muscovite and the other half biotite, the line of division between the two colors being a perfectly straight line, and there being no apparent change beyond the color in the uniformity of the sheet. Other sheets again are marked with a chequered pattern in black lines, the lines being due to magnetite. Again there are dendritic inclusions of white quartz between the lamina. All these markings take from the value of the sheets. The most esteemed colors are pure ruby, amber, light green, transparent white. There is also a silver white, which the natives prize for inlaid work.

### LIGHTNING AND ELECTRIC LAMPS.

In a recent issue of "Nature" Mr. Sydney Webb, of Dover, describes in a letter some curious lightning effects he obtained by photograph in October last. He was endeavoring at the time to get photographs of lightning, but owing to the limited horizon available from the position of the camera it was not pointed in the direction where the most numerous flashes occurred It included in its field several of the brush arc lamps used to light the town. In developing a few of the exposures to see whether the photographs of lightning discharges had been obtained, Mr. Webb noticed some peculiar discharges taking place from the Brush arc lamps to the ground. A series of negatives were then taken, including these are lamps in the field, and also of others in which the system of incandescent lamps, which are festooned over the streets of Dover in the season, were shown. Mr. Webb's first impression was that the electric discharges of lightning produce corresponding ones from the lamps, but the number of lines seen on the photographs could not be explained in this way. The photographs were accordingly sent to Sir George Stokes, who gives in "Nature" his views at considerable length. He draws attention to the fact that in the photographs showing the discharge from the arc lamps the path to earth of the supposed secondary charge does not take place through the iron column of the lamp-post, as would be expected. It appears instead striking the ground some considerable distance from the base of the lamp-post. This discharge is also characterized on the plate by a series of dots of lights somewhat similar to the stratification in a vacuum tube. The similarity of the path of discharge from the individual lamp to the earth is excessively curious, and it must also be noticed that in every photo the same similarity is to be seen in the small flashes which take place from lamp to lamp. As regards the stratification which is seen in practically all the lines of discharge, Sir G. Stokes has two suggestions to make. One is that it might have something to do with the way in which the path crossed a series of electromagnetic waves like those of light, except as to the

scale of wave length. Another, which seems more probable, is that they are of the nature of a strong discharge in vacuum tubes. He points out that in an ordinary tube it requires a very good exhaust to get strata 1 in. thick. In the case in point, under atmospheric pressure the strata was a foot or more in thickness. However, with the Geissler tube the strata are closer in the capillary part, where the current is congested, than in the broad part. He suggests that it is possible that the discharges shown in the photographs, which are unconfined laterally, these wide strata are possible with a small density of current. He also remarks that the intensity of the discharges decrease as they go from the lamp to the ground, from which it would seem that the current gradually expends itself in electrifying the air. If this is the case, the long discharges represented in Mr. Webb's photographs may not be so dangerous as some of them look. Sir George Stokes concludes that until more is known of the subject it may be well to avoid standing in the proximity of these overhead lamps during a thunderstorm. As Mr. Sydney Webb points out, the details of these discharges are exceedingly confusing to anyone not acquainted with the relative position of the lamps, and a photograph taken in daylight with the camera in the same position as when the night photographs were taken would be of great value in clearing up what actually happened. It seems to us very unlikely that discharges so exactly similar in path should take place round a number of lamps at a considerable distance apart. The effect could be produced optically, only the size figure apparently made by the discharge on the photographic plate precludes this supposition. -" Electrical Engineer," London.

### Telegraphing by Means of Electric Light.

A patent has been granted to Carl Zickler, of Brunn, Austria, says the "Telegraph Age," on a system of telegraphy by means of electric light. In this method of wireless telegraphy, signals are transmitted by means of rays emitted from an arc lamp, the rays of short wave length (mostly ultra-violet rays) being the ones made use of.

These rays are sent out from the sending station at intervals corresponding to those of telegraphic signals and in the direction of the receiving station, where they produce weak electric waves, by which the signals are made visible as sparks, or are made audible by telephone or electric bell, or, if preferred, may be printed by Morse apparatus.

At the sending station in an apparatus similar to a searchlight projector, having either a reflecting mirror or lens, or both, in combination; if lenses are used, however, they must not be be made of glass, but of rock crystal, in order to allow the ultra-violet rays to pass through them. The pencil of ultra-violet rays from the lens may be interrupted by means of a glass shutter, which is operated by means of a bellows and a pneumatic ball, such as is employed with photographic apparatus. The ultra-violet rays are absorbed by the glass plate, being only emitted when the shutter is removed. By leaving the shutter open for a longer or shorter time, the ultra-violet rays may thus be sent out in a manner to correspond with the dots and dashes of the Morse alphabet.

The receiver consits of a tubular glass vessel closed air tight in front by a quartz plate. Within the vessel are two electrodes one of which has a spherical terminal a few milli-



meters in diameter, and the other a small circular disk so inclined that the pencil of light entering the glass vessel falls upon it and is reflected to the knob of the other electrode. Both electrodes are covered with platinum foil and are separated about ten millimeters. The air in the glass vessel is rarefied to a suitable degree, or the vessel is filled with a rarefied gas.

In front of the quartz plate is a tube fitted with a quartz lens, by means of which the rays coming from the sending station are concentrated upon the circular disk in a small, slightly illuminated spot. The two electrodes are connected with the secondary windings of a small induction coil. When the ultra-violet rays from the sending apparatus fall upon the disk-shaped electrode of the receiver, their luminous electrical effect causes sparking at the induction coil. The opening and shutting at the transmitting station in accordance with Morse signals thus produces at the receiving station a transmission of sparks of shorter or longer duration, according to the signals sent, In this way the signals may be made visible or audible, or recorded.

The most serious objection, however, is the lack of speed, for so far it has been impracticable to arrange transmitters and receivers to accomplish more than eight to twelve words a minute.

### THE ELECTRIC PROCESS OF ANNEALING ARMOR-PLATE IN THE CONSTRUC-TION OF WARSHIPS.\*

BY CHARLES J. DOUGHERTY.

Considering the rapid development and the many applications of electricity in the past few years to the needs and requirements of engineering work, few people realize the important part which it plays in the construction of the latest type of cruisers and battleships armored with harvevized nickel-steel or Kruppsteel plates. A modern battleship is nothing more or less than a floating fortress, its vitals. the machinery, being carefully protected from the enemy's shells by stout and almost impregnable steel plates, ranging in thickness up to 16½ inches. The new type of armor-plate specified for the Alabama is the "harveyized nickel-steel plate."

For those not conversant with the "Harvey process." I will briefly state that it is the introduction of carbon by cementation into the face of an ordinary low carbon-steel plate, and subsequently it is water-hardened similar to an ordinary tool. After this treatment it presents a hard-faced surface to the depth of about one inch, designed to stop and break up projectiles before serious penetration takes place. All armor-plates must necessarily be secured to the frame-work of the vessel in order to hold them rigidly. The plates must be drilled and tapped for this purpose, and herein lies the trouble. The methods heretofore used to produce isolated spots in the plates were principally two-(1) to protect the surface of the plate in patches or strips to prevent carburation wherever holes were expected to be drilled; (2) to make accurate drawings and patterns of each plate beforehand, to which all holes are drilled before the plate is hardened. This plan was practiced by the United States Government for a time, but had to be abandoned because it was found that numerous alterations in construction, errors in the draft-

ing-room or mills made it necessary to pierce the plate where no provision for annealing was made. It was also found feasible to drill and tap holes in the face of the armor-plate at any stage of the process prior to hardening, and without detraction from the plate's resistance; but it is not alway possible to locate these holes with precision without first fitting the plate in place on the ship; this was a very expensive method, and was abandoned in favor of one by which the carbon was prevented from penetrating over certain areas in the wake of the fastenings. This method also had its disadvantages, in that the carbon gases frequently seeped through the protection mentioned, and carbonized the surface beneath, The expedients adopted for preventing the carburation could not always be relied upon, and the great difficulty encountered was to pierce the surface, drill, and tap such a facehardened plate. The first experiments which were made to anneal these face-hardened plates by means of the oxyhydrogen flame and the electric arc were not successful, and the plates resisted most effectually all attempts to anneal the spots which were required to be drilled. Drills of every design and method of tempering were tried, but with no success: the plates could not be drilled by any of the above means. If the plates could not be held in position on the vessel, this meant serious delay in construction. The question of being able to anneal the spots required was becoming a serious matter: but, as many times before in other work of difficult character, the subtile fluid was the only agent that solved the problem, so also in the case of taking the temper out of certain spots to permit the drilling of holes in the harveyized plates, electricity came to our aid on the eve of despair and failure. The Thomson Electric-Welding Company of Lynn, Mass., made some experiments on harveyized plates. and very soon demonstrated their ability to anneal any surface, however hardened, by sending a current of large volume through any spot to be annealed, and by this means raising the temperature of the spot to about 1,000° F.; and at that temperature there can be little doubt that the temper has been withdrawn. This is the process that I wish to treat in this paper.

The apparatus which is necessary to perform the work of annealing these harveyized plates consists of a separately excited alternatingcurrent generator of variable potential, giving a maximum of 300 volts and a current of 100 amperes. The frequency of the generator is fifty cycles per second: the fields are separately excited by a small direct-current exciter of 110 volts and twenty amperes, made by the Thomson Electric-Welding Company, and it is belted to the generator from a pulley on the commutator end of the shaft, and delivers to the field of the generator a maximum current of fifteen amperes at full load. A german silver resistance-box placed close at hand under the control of the operator varies the current in the generator-fields, and thus increases or decreases the alternating electromotive force at the brushes of the generator.

The annealing machine proper is an alternating-current transformer similar to the wellknown welding transformers used in welding steel rails. For those of you who are not conversant with the meaning of the word "transformer" in an electric sense, it will suffice to say that an alternating transformer may be regarded as a species of dynamo, in which neither armature nor field magnets revolve as

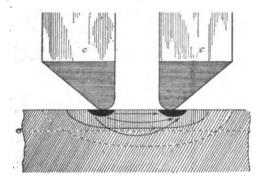
in an ordinary dynamo, but in which the magnetism of the iron circuit is made to vary through rapidly repeated cycles of alterations, by separately exciting it with an alternating current. The primary coil of the transformer corresponds to the field-magnet coil of the dynamo, while the secondary coil of the transformer may be called the armature-coil of the dynamo. In the alternating-current transformer, by whatever name called, the function of the iron core is to carry the magnetic lines of force (that are created by the current in the primary coil) through the convolutions of the secondary coil. The rate at which the magnetic lines due to the primary current are cut by the secondary circuit is the measure of the electromotive force given to the secondary circuit.

With this explanation of a transformer we can understand better the workings of this annealing machine. The transformer is of the copper clad type that is, one in which the secondary is composed of two copper castings, each having a rectangular groove; when bolted together, these form a closed rectangular frame in which the primary coil is held. The hollow space intervening between the primary and secondary is filled with a heavy body oil called "transil oil." This oil acts both as an insulator and a conductor of heat from primary to secondary. The secondary, by completely surrounding the primary, affords an excellent mechanical protection, and prevents electric as well as magnetic leakage. The latter features are quite important, since it is necessary to operate the annealer on board vessels in exposed positions during construction; yet it may be handled with immunity from electric shocks, even when operated in rain or in heavy snow. The primary coil of this transformer consists of a copper ribbon, each turn of the coil being insulated from the next by thin asbestos paper. The ratio of conversion is 100 to 1, and when the maximum voltage of 300 is generated at the brushes of the generator, we have about 2.5 to 2.8 volts at the terminals of the secondary of the transformer. The transformer has two trunions fastened to its sides in a line a little above the center of gravity. These trunions swing in bearingspart of a yoke which straddles the whole. The yoke in its turn has a hook which may be secured at any place of the arch, thus allowing the transformer to be suspended, like a compass in gimbals, in any desired position. The copper castings which compose the secondary circuit are cut through at one place. On either side of the cut two short platforms form the base for a saddle which holds the copper contacts of various shapes and sizes, by means of which the current is made to enter and leave the plate to be annealed. These contacts are made of forged copper of high conductivity, and they are hollowed out to receive a water circulation to keep them cool, and they terminate in a narrow tip which is rounded at the end. The total weight of the annealing transformer is about 1,000 pounds, and this is sufficient to insure proper contact pressure for all work on horizontal plates. When inclined surfaces are to be worked upon, the machine suspended so that its weight shall not interfere with the contact pressure, which is then obtained by bracing the contacts directly with wooden wedges against any object near by. Perhaps the most remarkable thing in the operation of annealing a spot is the great amount of current that is carried by the cop per contacts into the plate. The contact sur

<sup>\*</sup>Read December 16, 1899, and printed in the Proceedings of the Engineers' Club of Philadelphia.

face on the plate is seldom more than about half an inch square, yet 10,000 amperes are made to flow through it during the process of annealing. This current density per contact area is equivalent to 40,000 amperes per square inch, a density which is only rendered possible through the thorough cooling of the copper contacts by a continuous water circulation through them, as I have before mentioned.

In the original experiments made by the Thomson Company in annealing plates, one feature presented itself in the fact that in taking off the heating current when the spot was being annealed caused the heat to be to rapidly conducted away by the surrounding mass of metal that the heated spot became chilled, just as if it had been plunged into cold water. No manner of outside protection of the heated spot would prevent this chilling effect, and it was found that only a gradual and slow withdrawal of the current would produce the complete effect of annealing. The current must



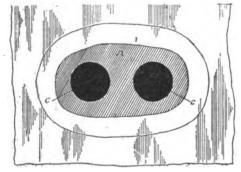


Fig. 1.

Method of introducing the Current into the Plate.

be brought up to the maximum value and then gradually cut down.

The interesting operation of annealing a plate is performed in the following manner: The transformer is placed in position, the contacts touching the plate on either side of the spot marked for annealing. Then the primary current is brought up by means of the rheostat, near at hand, to from eighty-five to ninety-five amperes for a period of from four to five minutes. The metal between the two contact places soon attains a dull red heat, and this temperature is experimentally found by holding a small pine stick in contact with the spot until it takes fire. This is the maximum temperature desired to anneal the spot properly. The current is now gradually diminished by turning the rheostat handle one point each minute until all the resistance is placed in circuit, and by this method the spot is gradually cooled and the chilling of the plate prevented. To illustrate the method of introducing the annealing current into the plate, I shall refer to Fig. 1: C C are the two copper electrodes, the current enters the plate by one end and leaves by the other, as shown by the arrows. Right under the contacts the metal comes to a bright cherry heat, shown in heavy black in the figure, while the portion intervening and partly surrounding the contacts acquires a temperature of just visible red. Line B B indicates where the influence of the Harvey process stops. The shaded portion in the figure shows the zone softened and ready to be drilled, while the dotted line shows how far the heat radiation would cause the metal to turn blue.

The operation of running a heat after the machine is set up takes in the neighborhood of from fifteen to twenty minutes, all depending on the size of the spot to be annealed. On examining the spot after the annealing process is finished, it is found to be a dull chocolate color, the place where the contacts have been resting is scaled and hard, and cannot be touched by a tool to the depth of a quarter of an inch.

In the construction of a modern man-of-war there are many armor-plates which act as shields to the guns. Some of them are circular, others oval. The only method possible to perforate these shields was after carburation and before being water-hardened, up to the discovery of the electric annealing process above described; but to-day, what a change! These plates are cut in various shapes to suit the work by simply annealing a number of spots forming the shape of the hole to be cut, and finally running a cutting tool over the surface thus annealed.

It sometimes happens in the construction of war vessels that the armor-plates have been made up too long to fit in their respective places, and they must have a certain length cut off after their delivery at the shipyard; this occurred several times on plates for the U. S. S. Iowa.

When such cases occur, there are two methods of annealing the plate: First, to lay off on the plate a line of holes side by side directly across the edge which is to be cut off, in the same manner as annealing spots for ordinary drilling—a slow process, indeed, since the annealer must be set for each individual hole. Second, to gradually move the transformer along the line to be annealed, the plate remaining stationary.

It has already been mentioned that it is absolutely necessary that the temperature of any individual spot should be gradually and slowly reduced in order to prevent any chilling. The effect of gradually withdrawing the heat from one spot to any other is accomplished in the second method, by moving the transformer itself, relatively to the plate to be treated, the rate of this movement, of course, depending upon the rate at which the temperature is to fall in any particular spot to prevent chilling. The transformer is arranged to be moved along a line to be annealed, the motion being obtained by an ordinary screw with a handle, the handle being turned at a predetermined rate controlled by a watch, and it was found that the correct speed was about a quarter of an inch per minute to insure positive and thorough annealing. Thus the work can be performed in a short length of time compared to the usual method of setting the machine for individual heats. The copper contacts used can be of the simplest kind; they bed themselves into the surface of the plate, and when dragged along by the screw, raise in front of themselves a clip similar to that produced by a planing tool, and even after a day's continuous moving are found to be intact.

In cases when the transformer is moved relatively to the plate to be treated, as in the method just described, it is a rather startling thing to find a number of steel chips lying

around which have been cut from the plate by the copper contacts; thus developing the peculiar phenomenon of a hard steel chip cut by a soft copper tool.

Besides annealing holes in armor-plate, the transformer may be used for the reversal of the annealing process—namely, for creating isolated hard spots in soft tool steel by sending a current through the spot to be hardened until it reaches a bright cherry heat, and then suddenly removing the current from the machine.

For annealing plates for the U. S. S. Alabama, two complete annealing plants have been at work continuously night and day, Sundays included, for a period of over six months, and upward of about 3,000 holes have been treated.

We have had no difficulty in annealing the harveyized plates of the Alabama, but in this age of advancement something new is constantly being invented; yesterday it was harveyized nickel-steel, and to-day Krupp's armor plates are considered superior to the Harvey or Corey plates. Krupp armor is now being placed upon all the newer vessels of our own and foreign navies.

The Krupp gas-process, as it is called, is a secret, and the rights of manufacture for this country have been purchased by the Carnegie Company of Pittsburg.

The supreme value of the Krupp armor consists in the fact that these plates enable the total weight of armor with which a ship is clothed to be greatly reduced, and the weight so saved may be appropriated to a more powerful armament, or engines and boilers of greater horse-power. Krupp armor shows remarkable toughness combined with all the hardness of the best face-hardened armor; and, unlike armor manufactured by other well-known processes, the Krupp product maintains these qualities in the very thickest armor. thickness of the hardness of Krupp's process is about 1.7 to 2 inches, while the harveyized process goes in about one inch. The new battleship Maine will have Krupp armor; the Russian battleship and cruiser now building at our shipyard will also be protected with it.

Since the Krupp process penetrates into the surface of the plate about two inches, we naturally imagined that it would require a greater length of time to anneal the spots, and after a little experimenting on a sample of this armor we were delightfully surprised to find that the time required to anneal a hole thoroughly was only a trifle longer than that for the harveyized steel plate.

### Important Papers to be Read.

The Southwestern Gas, Electrical and Street Railway Association will hold its next annual convention in Waco, Tex., on April 18, 19 and 20. The following named papers will be presented at the meeting: "Electrolysis," by E. H. Jenkins, of San Antonio, Tex.; "Meters and Incandescent Lamps," by W. R. Ruthell, of Waco, Tex.; "Electricity vs. Gas for Lighting Purposes," by J. F. Cullinan, of Denison, Tex.; "Street Railways of Texas From an Historical Standpoint," by F. E. Scovill, of Austin, Tex.; "The Attitude of Municipal Corporations Towards the Public," by John G. Boyd, of Terrell, Tex.; "Operation and Maintenance of Street Railways," by H. F. Mac-Gregor, of Houston, Tex. Papers on subjects yet to be selected will also be read by E. D. Dysterud, of Monterey, Mexico, and J. C. Lord, of Forth Worth, Tex.

### DEPARTMENT STORE ELECTRIC PLANT.

### BY BURCHAM HARDING.

The question often arises how best to supply electric lighting for a large department store. The electrical equipment for the largest department store in Detroit, that of the Newcombe-Endicott Company, is instructive in many ways. The large store with its several stories faces Woodward avenue, running back to an alley in the rear. Upon the opposite side of this alley is the power house, a one-story building of an unpretentious nature. The original power house, having a floor space of 1,350 square feet, contains a full boiler plant and coal bin, with a steam engine direct connected to a Westinghouse direct current generator.

A duplication of the amount of power for the lighting circuits having become necessary, but the space at disposal being very small and entirely insufficient for another steam driven unit, a small extension was built to the engine room measuring 11 x 18 feet, and in this annex has been installed a 50 horse-power gas engine direct connected to a generator. This addition duplicates the amount of current for the lighting circuits, but less than 200 square feet of floor space is occupied by it, as against 1,350 feet of the other half. In many cases it has been found that a gas engine with a direct connected dynamo is the most satisfactory method when an increase is required to an existing plant.

The gas engine installed in this plant, although nominally of 50 horse power, is frequently called upon for a much heavier load, which it carries with ease. The direct current generator, to which the gas engine is direct connected is rated, at 32½ kw., but the usual load upon it is 340 amperes at 125 volts, supplying 600 lights, and it has been operated up to 376 amperes for 750 lights. Natural gas is used for fuel for the engine, costing 28 cents per 1,000 cubic feet. The gas bill for twenty-six days, running ten hours a day with full load, was \$27.

This installation demonstrates several interesting features respecting gas engines. Among others, that the gas engine possesses as close a regulation as the best automatically governed steam engine. Also that it requires far less floor space in the power house. But perhaps the most important feature is in the cost of fuel. The engineer in charge of this plant states that it costs less to operate the gas engine for a whole day, than the value of the fuel required to start up the steam boiler. Considered solely as a machine for converting the total energy of fuel into mechanical work, the gas engine far surpasses its steam rival. There are gas engines in operation which can transform over 25 per cent. of the heat in the fuel into useful work, while in the very best recorded performance of steam engines barely 14 per cent. of the energy in the coal is accounted for, and in the average steam engine not more than 5 per cent. In small plants, consisting of common slide valve engines, with uneconomical types of boilers, less than 2 per cent. of the energy in the coal burned is converted into mechanical work. The gas engine transforming over 25 per cent. compares very favorably.

Where the service is intermittent, or power is required only for a comparatively short time each day, the gas engine plant has a decided advantage, because it is not, like the steam plant, subject to losses of radiation and leakage when standing idle under full pressure,

and from coal burned to bank fires and in raising steam. With the gas engine the expense of fuel begins and ends with the starting and stopping of the engine. But fuel is only one item of cost in the production of power. Due consideration must be given to the value of the additional space, as mentioned above, and the larger buildings required for a boiler plant, the cost of a stack, the labor of handling coal and ashes, the cost of attendance, oil and water, as well as depreciation, repairs and insurance on the boilers. As regards all these items the gas engine compares favorably with the steam engine.—From the Chattanooga "Tradesman."

### LONDON NOTES.

[From our London Correspondent.]

### Prof Lodge on Contact Electricity.

On February 9, Prof. Oliver Lodge, F.R.S., delivered his presidential address to the Physical Society, taking as his subject, "The Controversy Concerning Volta's Contact Force." He stated that those who take a metallic view of the Volta contact force are accustomed to deny that the Peltier evolution of heat measures the local EMF. existing at a junction.

They assert that it measures the rate at which that same EMF, varies with temperature. In the thermo-dynamic equation connecting the Peltier effect with the variation of E with temperature, the E which varies is not necessarily that at the junction considered, but is the total EMF. of the circuit. The reversible heat at a specified junction is a measure of the metallic EMF. located there. Those who say it is a temperature variation of the EMF, beg the question by locating the whole EMF, of the circuit at the particular junction they are considering, usually an interface of zinc and copper. At a chemical junction the EMF. is not purely thermal, and hence is not measured by the Peltier effect; it is chiefly of chemical origin, and is calculable from the energy of combination of the materials on either side of the boundary. At a metallic junction there is no such chemical potentiality. A strong current may be passed across a zinc-copper junction for years, and no brass is formed. It is therefore improbable that the chemical affinity of zinc for copper is the propelling influence which causes the EMF. located at such a junction. In showing the Volta effect experimentally, a trace of liquid can act detrimentally by form ing a conducting bridge between the plates. across which the bulk of the electricity passes as the metals are being separated. The safest and clearest mode of expressing the Volta effect is that it consists in an opposite charge acquired by dry zinc and copper, while in metallic contact a charge which results from an EMF. of fixed value, and is controlled solely by this EMF. and electrostatic capacity. It is undeniable that the order of the Volta force can be calculated from the differential heats of combination of the metals for oxygen, although it is doubtful whether it can be calculated from the heat of formation of brass. The opposing sides of the old controversy used to be called contact theorists and chemical theorists. Now the opposite sides are involved both in contact and both in chemical views. It is a question of which of several contacts is the effective one, and what kind of chemical action or affinity is the active cause. Is it the contact and chemical affinity across the metal junctions or across the metal air junctions? The opposite sides are thus metallic and dielectric. The metal air force is of the order volts, the metal force is of the order milli-volts.

When a piece of zinc is put in contact with a piece of copper the oxygen atoms which surround these bodies, move slightly away from the copper and approach slightly nearer to the zinc. These slight motions produce the whole Volta effect. All that is necessary for the Volta effect is the inherent film on the surface; all the rest of the gas is mere dielectric and might be substituted by a vacuum.

At the conclusion of Prof. Lodge's address, which by the way would fill a dozen columns of Electricity if published in full, it was arranged to hold a special meeting of the Society to discuss it.

### The Zipernowski-Deri Transformer Patents.

The claim set up by the present owner of the 1885 Zipernowski-Deri patent, for damages, etc., from the London Electric Supply Corporation, and therefore all alternating current stations employing this system of electrical distribution, has failed in the courts. On February 12 Mr. Justice Farwell delivered judgment at great length and dismissed the claim, granting costs on the higher scale to defendants. The hearing of the action occupied nine days, and the judge took time to consider his decision, which we need hardly say is satisfactory in that it prevents one-half of our electrical stations from having to pay heavy royalties for employing this particular arrangement of transformer distribution. The judge declared that he failed to find any "invention" in the arrangement.

### Prof. Hughes's Bequest.

Prof. D. E. Hughes, F.R.S., whose death has been already announced in this journal, has bequeathed \$10,000 to the Institution of Electrical Engineers as a David Hughes Scholarship Fund. The conditions are to be the same as under the Sir David Salamons Scholarship Fund.

### Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended March 10:

Aberdeen, 204 cases, \$2,573; Antwerp, 150 cases, \$5,885; Barcelona, 4 cases, \$22; Brazil, 137 cases, \$8,445; Bremerhaven, 1 case, \$30; Bristol, 93 cases, \$8,000; British Possessions in Africa, 12 cases, \$1,317, British West Indies, 9 cases, \$289; Central America, 47 cases, \$1,820; Chili, 222 cases, \$2,401; China, 34 cases, \$556; Genoa, 33 cases, \$2,097; Glasgow, 4 cases, \$190; Hamburg, 49 cases, \$7,521; Havre, 332 cases, \$9,279; Hull, 6 cases, \$417; Japan, 12 cases, \$180; Liverpool, 23 cases, \$902; London, 182 cases, \$8,347; Marseilles, 34 cases, \$2,755.

### Chicago Electrical Association.

The next meeting of the Chicago Electrical Association will be held at Room 1741, Monadnock Building, Chicago, at 8 P. M. on March 16. Mr. F. N. Boyer will read an address on "Arc Lighting."

### Proposals Invited.

The Interior Department is inviting sealed proposals until April 5 for furnishing the necessary materials and labor required to install an electric lighting system at the Flandreau Indian School, South Dakota. Full information can be obtained upon application to the superintendent of the school at Flandreau.



### LEGAL NOTES.

Supreme Court Justice Smith last week filed a decision at White Plains, N. Y., holding that the New York, Westchester & Connecticut Traction Company and the North Mount Vernon Railway Company had no right to lay tracks within the village of Eastchester and ordering that the tracks already laid on the White Plains road in Bronxville must be removed at the company's expense. An injunction is granted restraining the construction of the road, and a judgment for damages levied against the corporations.

James A. C. Johnson has been appointed receiver of the New York Electrical Works at No. 515 Kent avenue, Brooklyn, N. Y., by the Supreme Court in proceedings brought for the voluntary dissolution of the company.

### Recent Important Decision.

The suit brought against the Edison Electrical Illuminating Company of Baltimore City by Philip A. Brown was recently decided by the Maryland Court of Appeals.

Brown was a boy of eleven years of age and was employed by a person who was the proprietor of a store. The electric light current was introduced into the store by two primary wires, extending from a pole standing some seventy five feet east of the building to glass insulators which were attached by iron brackets about six inches long to the eastern-most end of the small roof of the store. From the insulators the wires passed into a fuse box and then into a converter from which the current was carried by secondary wires into the store. The primary wires from the pole to the converter were charged with a current of 1,000 volts, but the secondary wires extending from the converter into the store were only charged with the comparatively harmless current of 50 volts. The primary wire from the pole to the insulator nearest the house, and not more than six inches from it, was joined beyond the insulator, and the point of the joined wire was left sticking up and entirely uncovered. The same wire was exposed naked by reason of defective insulation at two other places about two or three inches beyond the insulator. Brown had been sent upon the roof to clean the gutter and water spout, and shortly afterwards he was found lying insensible upon the roof with his head in contact with the exposed joint in the primary wire.

The Baltimore Court of Common Pleas rendered judgment for the defendant from which the plaintiff appealed. In reversing this judgment the Appellate Court said: "Outside of any contractual relation between the parties in this suit the very nature of the business thus conducted by the defendant imposed upon it a legal duty towards every person who, in the exercise of a lawful occupation, in a place where he has a legal right to be, was liable to come in contact with the wires charged with this invisible but deadly power. This duty has been enforced by the courts in many cases in this State and elsewhere. As applied to the management by the defendant of its wires charged with the high tension current, this legal duty would require it to see that its wires, when strung where persons were liable to come in contact with them, were properly placed with reference to the safety of such persons and were properly insulated, "-(45 Atl. R. 182.)

West Union, O -The West Union Electric Light Company will erect a new electric light plant here.

### PERSONAL MENTION.

Mr. George F. Porter, sales manager for Kerite wires and cables, and Mr. Elmer P. Morris, representing electrical supply houses, are visiting Havana, Cuba.

Mr. A. W. Shoemaker has been appointed general manager of the La Bella Electric Power Company at Denver, Col., in place of J. E. Bell, who recently resigned.

Dr. Frederic A. C. Perrine of Trenton, N. J., was recently elected president of the Stanley Manufacturing Company of Pittsfield, Mass. Dr. Perrine is an expert in electrical matters. He has for years been a keen student of electrical development, and as a professor of electrical engineering in the Leland Stanford University won the reputation of being one of the brightest minds in the Western electrical would.

Mr. William H. Spaulding, formerly of Clinton, Mass is now superintendent of the Westerly (R. I.) Gas & Electric Light Company's plant,

Mr. E. M. Addls has resigned the position he held in New York and is now superintendent of the Spring Valley Electric Illuminating Company. He served in the same capacity before going to New York.

Mr. Thomas A. McLoughlin of the General Electric Company, who has been located in London for the past eight months, will return to America this month. Mr. McLoughlin's headquarters will be in New York City,

#### INCORPORATIONS.

The New Mexico Light, Heat & Power Company, Pueblo, Col.-to furnish light, heat and power. Capital stock, \$30,-000. Incorporators: E. S. Woods, F. L. Guddeback and H. E. Currie, all of Pueblo.

The Williamson Electric Light & Power Company, Williamson, Va.-to build an electric light plant. Capital stock, \$50,-0.00. Incorporators: C. H. Jones and T. B. Gerner.

The Mt. Whitney Power Company, Visalia, Cal.-to manufacture, generate and produce electricity, electric power, etc. Capital stock, \$300,000, Incorporators: W. H. Hammond, A. G. Wisbron, R. P. Hammond, B. M. Maddox and S. Mitchell, all of Visalia.

The St. Joseph & Elkhart Power Company, Mishawaka, Ind. Capital stock, \$50,000. Directors: E. A. Saunders, James DuShane, J. C. Eberhart, C. H. Tenney and Fred P. Dalafield.

The Murray Electric Light & Power Company, Monticello, N. Y. Capital stock, \$20,000. Directors: Peter C. Murray, Delia Murray and E. S. Rockefeller, all of Monticello.

The Seth W. Fuller Company, Boston, Mass.-to buy and sell electrical goods, etc. Capital stock, \$20,000. Incorporators: I. R. Clark, A. W. Leonard and C. E. Stratton.

The American Electric Switch Company, Pittsburg, Pa. Capital stock, \$20,000. Directors: John H. Spangler, Charles Sohn and Ernest Gawthrop.

The Electric Light, Heat & Power Company, Hammonton, N. J. to furnish electric light, etc. Capital stock, \$25,000. Incorporators: F. J. Thorn, Edgewater Park: G. E. Brett, Philadelphia, and C. C. Gallagher, Beverly,

The Five-Mile Beach Light, Heat & Power Company, Wildwood. Pa.-to furnish electric light, heat, etc. Capital stock, \$100,000. Incorporators: H. H. Ottens, Wildwood: S. W. Fleming and G. Moffatt, both of Philadelphia, Pa.; H. S. Douglass, attorney.

The Buffalo Electric Carriage Company, Buffalo, N. Y. Capital stock, \$20,000. Directors: Frank A. Babcock and Isidore Michael of Buffalo.

The United Electric Gas & Power Company, Los Angeles, Cal. Capital stock, \$650,000. Directors: H. V. Carter, Frederick H. Rindge, Alfred Stedman, George I. Cochran and J. J. Davis.

The Buffalo Electro-Surgical Instrument Company, Buffalo, N. Y. Capital stock, \$9,000. Directors: Becker, E. C. Lapham and Charles Taylor, all of Buffalo.

The Ida Grove Electric Company, Ida Grove, Ia.-to do an electric business. Capital stock, \$30,000. Incorporators: J. W. Reed and F. A. Lusk, both of Ida Grove.

### ELECTRICAL PATENT RECORD.

{ This department is edited by OSCAR A MICHEL, Solicitor and Attorney for AMERICAN AND FORFIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington. D C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway,

New York City, N. Y., or 639 F street, N.W., Washington, D. C. Copies of any patent published can be furnished upon p ment of ten cents. When ordering give name, date and title of invention wanted.

### LETTERS PATENT ISSUED MARCH 6, 1900.

### ELECTRIC RAILWAYS AND APPLIANCES.

644,596. Car-Fender. Domenico Guarino, New York City, Filed July 5, 1899.
 644,639. Electric Railway Signal. Judson Shoecraft, Topeka.

Kan.

346. Insulator for Use on Electric Railways. James Thomas and William R. Thomas, Catasauqua, Pa. Filed

Thomas and William R. Thomas, Catasauqua, Pa. Filed Dec. 12, 1899. 015. Electric Railway. Warren B. Reed and Lyman C. Reed, New Orleans, La., Filed Oct. 16, 1899. 021. Underground Electric Railway. George W. Smith, Dallas, Tex. Filed Aug. 23, 1899.

### ELECTRIC LIGHTS AND APPLIANCES.

ELECTRIC LIGHTS AND APPLIANCES,
644,562 644,563. Electric-Arc Lamp. Thomas E. Adams,
Cleveland, O. Filed Ang. 16, 1899, Sept. 20, 1899.
644,783 644,784-644,785. Electric Glow-Lamp. John Van
Vleck, New York City. assignor to Christopher D.
Smithers, same place. Filed May 9, 1899, June 8, 1899.
644,816. Electric-Arc Lamp. William J. Davy. London,
England, assignor of one-half to Charles Williamson
Milne, same place. Filed May 25, 1899.
644,823. Electric Lamp for Bicycles. Gustavos Heidel. St.
Louis, Mo., assignor to the Globe Electric Company,
same place. Filed Jan. 9, 1899.
644,992. Electric-Arc Lamp. Edward M. Barnes, Cleveland, O., assignor to Arthur L. Garford, Elyria, O. Filed
April 10, 1899.
644,995 645,041, Vacuum-Tube Lighting. Daniel M. Moore,
Newark, N. J., assignor to the Moore Electrical Company,
New York City. Filed Nov. 9, 1899, July 27, 1899.

### ELECTRICAL MACHINERY AND APPARATUS.

ELECTRICAL MACHINERY AND APPARATUS,
644,666 Controller for Electric Motors, Maxwell W. Day,
Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Dec. 17, 1898.
644,684. Dynamo-Electric Machine. Henry G. Reist, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Oct. 27, 1899.
644,745. Electric Switch. Norman Marshall, Newton, Mass., assignor to the Marshall Sanders Company, Boston, Mass.
Filed April 25, 1899.
644,859 644,917. Electrical Measuring Instrument. Adrian.

Filed April 25, 1899.

879 644,917. Electrical Measuring Instrument. Adrian.
H. Hoyt. Penacook, N. H. Filed Sept. 22, 1899.
878. Automatic Circuit-Breaker. David W. Stinson, St. Louis, Mo. Filed July 3, 1899.
010. Electric-Circuit Breaker. Lyman C. Reed, New Orleans, La. Filed Aug. 5, 1899.

### TELEPHONES AND TELEPHONE APPARATUS.

TELEPHONES AND TELEPHONE APPARATUS.
644,594. Telephone System. Joshua W. Gore, Chapel Hill, N. C. Filed Aug. 16, 1899.
644,647. Selective signal for Telephone-Circuits. George K. Thomson Malden, and Ernest C. Robes, Medford, Mass., assignors to the American Bell Telephone Company, Boston, Mass. Filed July 18, 1899.
644,652. Telephone-Transmitter. Joseph M. Wilderman and Enoch A. Nelson, St Charles, Mo. Filed Aug. 24, 1899.
644,653. Coin-Actuated Mechanism for Telephones. Arthur F. Wines, Chicago, Ill.: W. S. J. Wines administrator of said Arthur F. Wines, deceased. Filed Sept. 15, 1897.
644,890. Telephone-Guard. Lillian B. Ordway, San Francisco, Cal. Filed Dec. 12, 1898.
644,898. Telephone Signal-Circuit. Dana McNeil, Chadron, Neb. Filed July 12, 1899.

### MISCELLANEOUS.

MISCELLANEOUS.

644,591. Electric Drill, etc. Warren P. Freeman, New York City., assignor to the Empire Electrical Machinery Company, same place. Filed April 8, 1899.

644,671. Electric Motor Car. Charles M. Johnson, New York City. Filed Aug. 8, 1848.

644,714. Telegraph Sounder. Samuel F. Lively, Alderson, W. Va. Filed June 6, 1899.

644,716. Electric-Car Brake. Uldereque E. Maille, Providence, R. I. Filed July 7, 1899.

644,779. Process of Manufacturing Metallic Carbonates by Electrolysis. Joseph W. Richards and Charles W. Roepper, Bethlehem. Pa., assignors to the American Electrolytic Company of Delaware. Filed July 6, 1897.

644,799. Railway Signaling System and Apparatus Therefor, Henry Bezer, New Rochelle, N. Y. Filed July 22, 1893. Renewed Oct. 11, 1898.

644,794. Tool for Laying Conduits for Electrical Conductors. James F. Cummings, Detroit, Mich., assignor to the American Vitrified Conduit Company, New York City. Filed July 22, 1899.

644,834. Gramophone. Henry K. Smith, Philadelphia, Pa. Filed July 10, 1899.

644,844. Electric Switchboard. Mary T. Bunnell. New York City. executrix of Jesse H. Bunnell, deceased. Filed Nov. 18, 1889.

644,852. Electric Pump. Carl Eickemeyer, Yonkers, N. Y. Filed July 27, 1899.

644,852. Electric Pump. Carl Eickemeyer, Yonkers, N. Y. Filed July 27, 1899.

644,864. Electromotive-Force Regulation. Benjamin G. Lamme, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company of Pennsylvania. Filed June 14, 1899.

644,865. System of Electrical Distribution. Benjamin G. Lamme, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company of Pennsylvania. Filed June 14, 1899.

644,865. System of Electrical Distribution. Benjamin G. Lamme, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company of Pennsylvania. Filed June 14, 1899.

644,972. Induction-Coil for X-Ray Apparatus. Reginald A. Fessenden, Allegheny, Pa., assignor to the Fessenden Manufacturing Company of Pennsylvania. Filed June 14, 1899.

Fessenden, Allegheny, Pa., assignor to the Fessenden Manufacturing Company, Pittsburg, Pa. Filed March 19,

1807. 1807. 1801. Graphophone Reproducer. William Hart, Kirks-ville, Mo. Filed Nov. 22, 1897.

vine, 310. Fried Nov. 22, 1897. (007. Protective System and Apparatus for High-Tension Electric Currents. Lyman C. Reed, New Orleans, La. Filed July 17, 1899.

r neu July 17, 1809, 608. Protective System of Electric Distribution. Lyman C. Reed. New Orleans, La. Filed July 17, 1890. 6011. Underground System of Electrical Distribution. Warren B. Reed and Lyman C. Reed, New Orleans La. Filed Aug. 21, 1899.



### GENERAL NEWS.

What is Going On in the Electrical World.

#### LIGHTING.

Alliance, O.—This city will erect a municipal electric light plant for public and private use, to cost \$35,000.

Alton, Ill.—The Alton Electric Light Company will receive bids for an electric light plant to cost \$20,000.

Amarillo, Tex.—An electric light plant will soon be

Americus, Ga.—The city council has granted a franchise to an electric light and power company to build an electric light plant here.

Batavia, O.—Bids will be received until March 27 for erecting an electric light plant to supply 40 arc lights, to cost about \$30,000.

Boonville, Mo.—The city council is discussing the question of building an electric light plant.

Cayuga, Ill.—This village is preparing to erect an electric light plant.

Dayton, O.—The board of city affairs have completed the specifications under which bids will be received for lighting the city by means of electricity and incan-descent gas. The bids will be opened March 29.

Decatur, Ill.—The business men of this city are about to establish an independent electric lighting plant.

Durham, N. C.-The Durham Electric Light Company is preparing to rebuild its electric light plant which was recently burned. The new plant will cost

Kenton, O—At the April election the question of issuing \$20,000 in bonds to build an electric tight plant, to be operated and owned by the city, will be submitted

Laurel, Md.—A bill has been introduced in the Legislature providing for a bond issue of \$10,000 for the purchase or construction of an electric light plant.

Leadville, Col.—The Leadville Electric Light Company proposes to enlarge its plant. About \$100,000 will be expended in making improvements.

Merchantville, Pa.—The Merchantville Light, Heat & Power Company, which recently accepted the ordinances passed by the council, will shortly erect a new plant both for production of gas and electricity.

Minot, N. D.—This town will erect an electric light plant this spring.

New Lisbon, Wis.—The New Lisbon Advancement Company contemplates the erection of an electric light plant. W. H. Cash, president.

New Haven, Conn.—Petitions are in circulation here asking the board of warden and burgesses to light the borough with electricity instead of the naphtha lamps now in use.

Norfolk, Va.—On March 6 the Norfolk Heat & Power Company filed a bond in \$10,000 binding themselves to egin the erection of an electric light plant within four

Onsway, Mich.—The citizens of this place are discussing the question of erecting an electric light plant.

Polwin, Kan.—The electric light plant of this city will soon be increased by the addition of another dynamo.

Rutherford, Tenn.—A company has been formed here for the purpose of putting in an electric light plant.

Safford, Ariz.-A new electric light plant is to be erected here.

erected here.

Slatington, Pa.—The Citizens' Electric Light & Power Company's plant at this place has been leased to the Allentown & Slatington Trolley Company for a period of thirty years with the privilege of buying the same at a certain figure. A new and much larger plant will be erected further down along the canal, which will be quipped to furnish the power to run the electric cars, light and other power for the town.

Gouth Pand Ind.—A 13 ft. dam. 1 200 ft. long, will

South Bend, Ind .- A 13 ft. dam, 1,200 ft. long, will be built in the St. Joseph River and will furnish water sufficient for an electric light plant of 10,000 horsepower, which will be built as soon as the water power is available.

St. Paul, Minn.—City Engineer Claussen has a scheme for the city to own its electric light plant, and will submit a report on the subject to the conference committee at the next meeting. The new plant will cost \$250,000.

Swainsboro, Ga -An electric light plant will soon be erected at this place.

Uxbridge, Mass.—The Uxbridge & Northbridge Electric Light Company has decided to build its new plant in this city.

Yonkers, N. Y.-Last week the committee on lamps reported in favor of an act to be submitted to the Leg-islature authorizing the common council to establish a municipal electric light plant at a cost not to exceed \$175,000.

Wadesborough, N. C.—Sealed proposals will be received by the commissioners of this town until 3 P. M., Thursday, March 22, for constructing a system of waterworks and electric lights. Plans and specifications, forms, etc., may be obtained from the engineer or town

clerk. Address W. P. Parsons, clerk and treasurer. Wadesborough, N.C., or Henry E. Knox, Jr., engineer, Charlotte, N.C.

### STREET RAILWAYS.

Afton, N. Y.—A proposition to connect this village with Deposit by an electric railway has been indorsed by residents of both villages. It is understood that people living along the proposed line would willingly render what assistance they could toward furthering the project.

Albion, Mich.—F. N. Rowley, representing the Kalamazoo Valley Electric Street Railway Company, has applied to this city for an electric railway franchise.

Battle Creek, Mich.—This city is to be the terminus of another interurban electric railway. Parties have secured the right of way for a line running south to Burlington, Union City and to Coldwater.

Cadiz, O.—Harrison county has granted to J. A. hite the franchise for an electric railroad connecting White the franchise for a Wheeling and this city.

Cincinnati, O.—Homer Morris of this city is promoting the interests for an electric line between here and Richmond, Ind.

Harrisburg, O.—Efforts are being made by the Grove City electric line to extend its lines to this city, a distance of seven miles southwest of the southern terminus of the road at Grove City

Indianapolis, Ind.—The building of electric lines in this State promises soon to connect this city and Colum-bus, O, and take in D syton on the interurban route between the two capitals.

Lima, O -Representatives of the Cleveland Traction Company are figuring on building an electric line from this city to Wapakoneta, thence to St. Mary's, then to Minster, and from there to Piqua.

Los Angeles, Cal.—The Temple street cable road in this city is soon to be run by electricity. Marietta, O—The Central Ohio Electric Street Rail-

road Company has asked the county commissioners to grant a franchise for a suburban line from this city to Parkersburg on the Ohio side of the river.

Metamora, Mich.—Simmons & Curry of Datroit are after franchises for an electric road connecting Oxford, Thomas, Metamora, Hunter's Creek, Lapeer, North Branch and Clifford, to be known as the Oxford, Lapeer & North Branch Railway. Influential persons at this point have been asked to co-operate and a public meeting will be held meeting will be held.

Pitisburg, Pa.—The West End Traction Company contemplates the construction of a branch line to the works of the American Steel & Wire Company on Neville Island. The line will be used for the transportation of building material for the big blast furnaces and wire mills now in course of erection.

Richmond, Ind.—The Richmond city council has granted a franchise to the company backed by F. Wesson, of New York, for an electric line to connect this city with Eaton, O.

Riverton, N. J.—The borough council has granted a franchise to the Delaware River Trolley Company to lay its tracks through the borough. This company now right of way from Trenton to this place

Sumpter, Ore.—An electric railway through the streets of this city to all the outlying and semi-urban additions; an eight mile trolley line from here to Bourne, and finally an electric railway 20 miles long. from Sumpter to Granite, are now among the assured facts for 1900.

Wabash, Ind.—F. L. Boyd, a New Haven, Conn., electric car builder, is trying to secure the right of way for an electric railway line connecting Wabash and

Waukegan, Ill.—Eastern capitalists, represented by W. F. Dimmick, of Chicago, who are planning to build an electric railway from Waukegan to Fox Lake, Ill., will also build a line from Waukegan to Kenosha if favorable arrangements can be made.

### COMPANY MATTERS.

Alton, Ill.-The Alton Railway, Gas & Electric Company will spend \$50,000 in dynamos, etc., and a like amount in other improvements.

Boston, Mass.—A short time ago the Lynn & Boston Railroad obtained control of the Wakefield and Stone-ham and Salem and Gloucester Electric Railroads. The headquarters of the system will be at Lynn, and the entire road from Scollary Square to Cape Ann, and from Lynn to Woburn and Billerica will be controlled from the offices in that city.

Cameron, Tex.—The Goldthwaite Brothers have sold their electric light plant to the Cameron Water, Light & Power Company, and the latter will move the dynamo to the river and the power will be furnished there in connection with the pumping of the water to the standpipe The company will take possession the 15th of May and are now putting in poles to the river to place the wireson.

Cleveland. O—The barns of the Cleveland, Berea, Elyria and Operlin Electric Railroad, west of this city, were destroyed by fire recently. About a dozen cars were also burned. Loss \$60,000.

Hartford, Conn.—It is planned by the Holyoke Water Power Company to spend several thousand dol-

lars the coming summer in improvements to the dam

New York.—H. H. Vreeland president of the Metropolitan Street Railway Company has submitted a special report to the executive committee of the board special report to the executive committee of the board of directors concerning the contemplated improvements in the construction and operation of the company's lines during the present year, which will cost between \$8,000,000 and \$10,000,000. Among the most important changes will be the substitution of electricity for cable on Broadway, Columbus and Lexington avenues. Electricity will also be installed in place of horse power on the line between 6.h and 8th avenue and the Christopher streat ferry. pher street ferry.

Philadelphia.—At a recent fire in this city the building in Cherry street occupied by the Philadelphia Electrical Equipment Company was totally destroyed, entailing a heavy loss.

Troy, N. Y.—The Taylor Electric Truck Company will during the present month remove its plant from this city to Colonie, where it has purchased about four and one quarter acres of land. The company supplies trucks for the principal electric railway corporations throughout the United States and Canada. Becently it has a state of the principal electric railway corporations. it has entered foreign fields, and has in view large con-tracts in Scotland and other parts of Europe.

Wilmington, Del.—The Delaware Electric & Supply Company has received a contract from the Delaware Paint Company of Newport, for one fifty-pound horse power engine with a 100-pound boiler.

#### MANUFACTURING.

Braidentown, Fla.—The Lyle Manufacturing Company, lately incorporated, will build an electric plant at this place.

Newark, N. J.—The Automobile Dry Accumulator Company, recently incorporated, will manufacture all kinds of electric batteries and dry electric accumulators. The company is capitalized at \$100,000.

### POWER AND TRANSMISSION PLANTS.

Asheville, N. C.—There is a project on foot for the development of electric power on the French Broad River. A corporation, to be called the W. T. Weaver Power Company, has been formed, the incorporators and stockholders being W. T. Weaver, Gen. T. F. Davidson, James L. Wagner, T. W. Raoul, J. H. Lougie and A. B. Williamson. The old Vance property, five miles below here, has been purchased, consisting of 200 acres. The electricity will be sold in this city, and 1,100 horse power will be developed. Work will begin at an early date. The dam will be 6 feet high, the canal 1,250 feet long, with a head of 14 feet, capable of supplying 54,000 cubic feet of water per minute. Locknort. N. Y.—Many of the manufacturing con-

supplying 54,000 cubic feet of water per minute.

Lockport, N. Y—Many of the manufacturing concerns of this city are operating by electric power and there is a demand for more power which cannot at the present time be met. The incorporation of the Newfane Pewer Company in Albany recently and the operations to dam Eighteen Mile Creek for power purposes are being watched here with interest. The dam is to be 50 feet high and will make it possible to generate an immense amount of power. The proposed Olcott electric railway extension will be operated from the new power plant and there will be a large surplus to sell in this city. this city.

Snoqualmie, Wash.—The Snoqualmie Falls Power Company proposes to enlarge its plant so that it will produce at least 20,000 horse power daily. The company is capitalized at \$600,000 and it supplies power to Seattle, Tacoma and Everett.

### MINES.

Bear Creek, Col.—Col. C. H. Nix is at work on an electric plant here. It is estimated that this plant will generate not less than 20,000 horse power. It will not only furnish light and power to most of the mines about Ouray which do not have their own electric plants, and light for the city of Ouray, but the motive power for the new electric road which Otto Mears proposes to construct on the line of his old toll road from Ouray to Ironton. road from Ouray to Ironton.

### AUTOMOBILES.

New York.—A run up into Westchester County is being arranged by the Automobile Club of America for this month, probably about the 20th, if the roads are in a fit condition. Starting from the Waldorf-Astoria the run will be to Tarrytown, then across Westchester County to Port Chester, and thence back to New York. The route covered will be from 70 to 75 miles, the longest run attempted by the club. It will afford an excellent preliminary test for the longer run to Philadelphia, in April. run to Philadelphia, in April.

run to Philadelphia, in April.

Washington, D. C.—Several plans are in contemplation for the establishment in this city of a public service of electric vehicles over designated streets. The vehicles will hold about fifteen passengers. A local company is being formed for the purpose of operating a vehicle of this kind, the invention of a Washington man, now being manufactured for the purpose. It is understood a concern which already has a plant in this city for the care of electric vehicles, and where the batteries can be renewed, proposes to place conveyances for public service on the streets, and it is said arrangements have been made for transfer privileges with one of the street car companies.



# THE TELEPHONE WORLD.

#### A Serious Blow to the Bell.

Regarding the acquiring of the Erie Telephone & Telegraph Company by the Telephone, Telegraph & Cable Company of America the N. Y. "Commercial "says:

"Various interpretations are placed by Wall Street upon the purchase of the Erie Telephone & Telegraph Company by the Telephone, Telegraph & Cable Company of America, but it is generally conceded that the acquisition of the Erie will prove a serious blow to the Bell Company. None of the officials of the Bell Telephone Company would discuss the matter. They were apparently much disturbed by the turn things had taken, and have not yet had a chance to prepare against further hostilities on the part of their young and vigorous rival.

"It is conceded that the Telephone. Telegraph & Cable Company will now have no difficulty in extending its lines throughout the territory east of the Mississippi. It is reported that the independent company paid \$110 a share for a controlling interest in the \$10,000,000 stock of the Erie. The former will offer to take up all of the Erie shares with a 5 per cent, bond secured by the Erie stock.

cent. bond secured by the Erie stock.

"The great resources of the Telephone, Telegraph & Cable Company may be judged by the fact that its capital is \$30,000,000, and there is no difficulty in disposing of it as rapidly as funds are needed.

"Many persons believe that the Western Union Telegraph Company is back of the independent telephone company, but assurances have been given by directors of both companies that there is no foundation for this report. The Western Union owns \$5,000,000 of the stock of the New York Telephone Company, and is also interested in other companies controlled by the Bell Company.

"One thing seems certain. Both of the telegraph companies are jealously watching developments in the telephone world, and they are prepared to take sides at once if they see their interests threatened. The telephone companies are encroaching more and more on the telegraph companies, and the latter will scon have to do something to protect themselves."

### Nickel in the Slot Telephones for St. Joseph, Mo.

The Missouri & Kansas Telephone Company is about to introduce a meter telephone service in St. Joseph, Mo. The system is intended for use in residences, where an instrument is called into service only a few times during a day.

To use the instrument the receiver is removed from its hook and the bell-crank turted. This calls central. When connection with the desired number is secured the user of the line is told by central to "register," which he does by dropping a nickel into a metal box, and pushing a lever on the front of the receptacle. That completes the transaction and the line is in use. No charge is made for in-calls, the subscriber paying only for the calls he makes. The new service will be on the party line system, a number of instruments being placed on each line, the subscriber for whom a call is intended being indicated by the number of rings given in calling in. The new service has been in successful use in Eastern cities for some time, and was given its first trial in the West a few weeks ago, when the Kansas City exchange was equipped with it.

The New England Telephone & Telegraph Company laid their new cable across Vineyard Sound recently from a point near Nobska lighthouse to West Chop, a distance of four and one-half miles. The work was done by the Western Union cable boat. It is a submarine, six conductor cable, and can be used for both telephone and telegraph service, although its immediate use will be that of connecting Martha's Vineyard with the main land by long distance telephone. The exact location of the cable, as it was laid across the Sound, was taken by Government coast surveyors, with a view of its being properly advertised, thereby lessening the liability of its being caught up and broken by vessels anchoring near it.

The Hudson River Telephone Company had its annual meeting at Albany, N. Y., on the 1st inst. It was decided by a unanimous vote to increase the capital stock from two to three million dollars, the new stock to be disposed of that money could be had for enlargements and betterments.

Arrangements are in progress for the purchase of the Maryland, Pennsylvania and West Virginia Telephone Company, the Greensburg Telephone Company and the Home Telephone Electric Company by the Telephone, Telegraph & Cable Company of America.

The Bell Telephone Company has decided to build a line from Cortland to Burghill, Kinsman, Bristolville and West Farmington, Ohio, at a cost of \$40,000.

The Fairbury Telephone Company of Fairbury, Neb., has increased its capital stock to \$10,000 and will at once put in toll lines to the other towns in the county.

### The People's Telephone Company of Wilkes-Barre, Pa.

Considering the magnitude of the work performed, the People's Telephone Company of Wilkes-Barre, Pa., has in a remarkably brief period built up a telephone system that has but few, if any, superiors among the independent lines of the country. But the work of construction has not yet been completed and a true estimate of the system's value cannot be given before all of the suburban towns are connected, and then Wilkes-Barre will have a service second to none.

Almost \$200,000 has already been expended, but there will be a much greater outlay before the work contemplated by those behind the enterprise has reached the point laid down in the original plans. Exchanges are now in operation in Wilkes-Barre, Nanticoke, Pittston and Kingston, and before long Plymouth will be included in the list. The intention is to begin work on the trunk lines very shortly. This part of the work will take about two weeks and then the entire valley will be connected. The work, however, will not stop here, as a franchise at Scranton has been secured by an independent company, which will have connection with the system in Wilkes-Barre and when the construction is completed in Scranton the People's subscribers will have service between Wilkes-Barre and Carbondale, where there is now an independent company. To complete this circuit it will probably take until next October.

### Telephone War in Iowa.

A new independent telephone movement has been commenced in Iowa, where the Iowa Bell Company is now operating. Among the companies which were absorbed by the Bell Company was the Ottumwa Telephone Company which controlled over 150 miles of wire. New companies are being organized to take the place of those companies which have been absorbed by the Bell Company.

The Union Telephone Company of Fort Scott, Kan., operating long distance lines over southeast Kansas, has brought suit to enjoin the Mutual Telephone Company. owning the largest local exchange in Fort Scott, from disposing of seventy-three shares of unissued stock and to compel the Mutual Company by mandamus to issue the stock to it. The Union Company is composed of a minority of the Mutual Company stockholders, and when it was learned that it was seeking to get control of the stock at \$55 per share the stock jumped to \$125 per share, which the Mutual Company claims to have refused for the plant.

The Union Company offered the market value for the unissued stock and tendered \$4,000 in gold in payment for it. The Mutual Company refused to issue it and the suit is to compel it to do so. Both companies are paying big dividends. The Union Company seeks to get possession of the Mutual Company's plant, to operate it in connection with its long distance lines.

The Hopewell Telephone Company of Hopewell, N. J., held its annual meeting on the 1st inst., when the following officers were elected: President, John N. Race: vice-president, Dr. T. A. Pierson; secretary, C. E. Voorhees: treasurer, Theo. M. Hall; directors: John N. Race, F. F. Holcombe, C. E. Voorhees, D. L. Blackwell, William H. Slugg, J. Mason Ege, Geo. E. Pierson, Dr. T. A. Pierson, Theo. M. Hall; manager, Jonas B. Sutphin. Nearly fifty telephones are now in service in that borough.

The Long Distance Telephone Company has begun putting in a line from Grand Forks to Larimore, N. Dak. This circuit will be extended in the summer, in all probability, and it is thought that it will find its eastern terminus at Devil's Lake. The next work to be taken up by the company will be the construction of a line from Crookston to St. Vincent, and this will make a belt line from Grand Forks that will traverse a rich section of the country as follows: From Grand Forks to Grafton, thence to Bathgate, Pembina, St. Vincent to Crookston and back. A number of other lines are also projected.

Seventy-five per cent. of the capital stock of the New York & New Jersey Telephone Company of Brooklyn was represented at the annual meeting and election of officers recently held at 81 Wilioughby street, Brooklyn. There was but slight opposition to the re-election of the old board of directors and inspectors as follows: Charles F. Cutler, Alexander Cameron, Joseph P. Davis, Charles A. Nichols, Hugh Kinnard, Wilham D. Sargent, David B. Powell, George H. Prentiss, Felix Campbell, Edward J. Hall, H. Sanger Snow, Zenas Crane.

A dispatch from Bristol, Tenn., to the N. Y. "Commercial" states that the Postal Telegraph Company has tested the telephone wires of the East Tennessee Telephone Company and found that they can be made to do the double duty of transmitting telephone and telegraph messages.

### Telephone Relief för Washington.

At one time the sentiment of the people of Washington, D. C., was decidedly adverse to the proposition of solving the telephone rate trouble by incorporating a rival company. It was felt that better results could be secured by the regulation of the rates charged by the established company, and that the reform was not worth the trouble of tearing up the streets for a duplicate set of conduits. Now that the effort to regulate the rates of the old company has been thwarted by a court decision, however, and the demand for lower rates is even more insistent than ever, the sentiment of the people has undergone a change and favors the alternate remedy of a new company. The District committee of the House has decided to report favorably one of the pending bills to this end, and it is announced that it will be taken up by the House at the next District day. Whatever company is chartered, provided it is surrounded by safeguards and requirements calculated to insure good service, the people will welcome the prospect of relief from the burden under which they have labored for years. Prompt action by the House will pave the way to similar action by the Senate at this session.

### Hear a Sermon Through the Telephone.

ELKHART, Ind., March 11.—The telephone as an agent of Christianity was given a practical test here this forenoon when fifty persons heard through a telephone in their homes a sermon delivered at the First Presbyt rian Church by the Rev. Dr. F. H. Gwynne. The feat was accomplished through the use of an extremely sensitive transmitter just invented by G. H. Fister and Herbert Row of the Home Telephone Company. This transmitter was fixed on the pulpit. Twenty connections were made at a time and one was with the residence of a citizen of Goshen, ten miles distant. The only other public test of the invention was on last Tuesday, when the addresses before the Republican Congressional Convention was transmitted to towns forty miles away. The inventors are working on a receiver which will be so loud that it need not be placed to the ear.

The stockholders of the New Telephone Company of Indianapolis, Ind., on the 9th inst. re-elected the old board of directors and the following officers: A. H. Nordyke, president; Simon P. Sherin, vice-president and general manager; H. B. Gates, secretary, and M. B. Wilson treasurer. The company has 4,000 'phones in use.

At a recent hearing before the Massachusetts Legislative Committee on Mercantile Affairs, S. L. Powers, counsel for the New England Telephone Company, caused a sensation by receding from his former position and expressing himself as in favor of State supervision of telephone companies provided the committee considered that to be the best policy.

The co-operative telephone companies, organizing in the rural communities of Western Indiana, are proving successful, and are rapidly multiplying. The companies have connection with each other, but a small tax is levied on their communicating with patrons of other companies.

A telephone line is being built between Belmont, Spottsylvania County, Va., and Tinders Station, on the Piedmont, Fredericksburg & Potomac Railroad, to connect with the Fredericksburg and Orange telephone line.

The Citizens' Telephone Company of Columbia, Tenn., is now connected with the lines of the Lawrence County Telephone Construction Company. The stockholders will hold a meeting on March 15.

Tyndall, S. D., will have in all probability in the near future a telephone system, as steps looking to the construction of a plant are being taken by the business men of that locality

Danbury, Ia., will vote March 26 on the proposition of approving the franchise granted to the Odebolt Telephone Company by the town council.

Preliminary steps are being taken looking to the organization of a company to construct and maintain a telephone system in Canastota,  $N, Y_\star$ 

### TELEPHONE INCORPORATIONS.

The Mifflin & Widowville Telephone Company, Mifflin, O. Capital stock, \$1,000.

The Antwerp Telephone Company, Antwerp, O. Capital stock, \$10,000.

The Gould Telephone Company, Wilmington, Del. Capital stock, \$100,000. Incorporators: E. M. Valentine, C. C. Gould, F. Wister, all of Philadelphia.

The Rockford, Telephone Company, Rockford, O. Capital stock, \$10,000.



### SECURITIES. **ECTRICAL**

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; extension; gcn., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

## STOCKS.

PASSE	AYS.	PASSENGER RAILWAYS.											
fans.	Par	Capital Authorz'd		Bate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Capital		Bate and Date of Last Div.	Bid.	Asked
Albany, N Y - Mar 12 United Traction	100	2,000,000	\$1,759,000	1½ % Q., Nov. '98.	125	127	Hartford Conn Mar 12: Hartford Street Ry. Co Hartford & West Hartford RR Holyoke MassMar 12		\$4,000,000 1,000,000		3 % 8., Oct., '98.	1.0	=
Allentown Pa Mar 12:							Holyoke Street Ry, Co	100	400,000	400,000	1 % A., June, '98.	2075	212
Allentown & Lebigh Val. Trac Co		4,000,000	1,500,000	• • • • • • • • • • • • • • • • • • • •		15	Hoboken, N. J.—Mar 12 North Hudson Co. (N. J.) Ry. Co	25	1,250,000	1,000,000	8 %, 1892.	150	-
Bridgeport, Conn-Mar 12:	100	2,000,000	2,000,000	1 % Aug., '98	103		Indianapolis, Ind-Mar 12.		5,000,000	5,000,000		24	23
Esitimore Md.—Mar 12. a United Rail ways & Ricc, Cocom	. 50	24,000,000	18,000,000	••••••	161/4	1634	Lancaster, Pa.—Mar 12 Pennsylvania Traction Co	100	10,000,000				_
BOSTON, MASS.—Mar 12 New England Street By Noith Shore Traction Co	. 100 . 100 . 50 . 50	4,000,000 2,000,000 10,000,000	4,000,000 2,000,000 9,085,000 6,400,000	1 % Q., Jau.15, '97 6 % S., A. & O. 3% % S., Oct., '98. 4 % S., Jan. 2, '99. 2% % Aug. 98,	15 85 93 112 102	16 87 94 114 104	Lancaster & Ced. Electric Ry West End Street Reilway Louisville, Ky.—Mar 12: Louisville Rycom Louisville Ry	100	2,500,000	2,500,000	1½ %., April '98. 2½ % 8., Oct. I, '98		111
Brooklyn N. YMar 12: brooklyn Uity My Brooklyn Hap. Transis Uo., ir certf. eBrooklyn Heighte Hallroad*dBrooklyn Oily RR gusi eBrooklyn. Queens Uo. & Sub. Kk	100	20,000,000 200,000 12,000,000 2,000,000	12,000,000 2,000,000	3½ % Q., Jan., '99.	.31 69% 107 287	237 69¾ 109 239	Montreal Street Ry. Co	50	4,000,000	1,712,200 4,000,000	1¾ %. Oct., '98. 8 % 8., M. & N. 1¾ % 8., J. & J.		187 187 374 100)
eBrooklyn, Queens Co. & Sub. K.B. Coney Island & Brooklyn RR Kings County Kievated Kings County Traction Co Massau Electric Railroadpfd /Atlantic Avenue Railroad  @Brooklyn, B. & W. E. Railroad	100	4,750,000	4,750,000 4,500,000 6,000,000 2,000,000	1 % July 26, '97	345 15	: :0 ::	Memphis Tenn.—Mar 12: Memphis Street Rallway Co New Haven, Conn.—Mar 12: Fair Haven & Westville Rk New Haven Street Railway Co	25 100	2,000,000 1,250,000	2,000,000 1,000,000	8 % S., Sept. '98. 2% % A., July '96.	2 ·	41
Buffalo N. Y Mar 12: Buffalo & Niagara Falis Kiec. Ry Buffalo Railway Co				1 % Q. Dec., '98.	74 100	75 103	New Haven & Centerville	100 25				45	45
Columbus O.—Mar 12 volumbus Street Ratiroad Columbus Street Ratiro d, pfd Charleston, S. C.—Mar 12 Charleston City By. Co	100	8,000,000	8,000,000 1,500,000	l % Q., Feb., '99.	26 82	26 % 83	Canal & Claiborne RR. Oo. New Orleans & Carrollion RR. New Orleans Traction Oo new com. New Orleans Traction Co new pfd aCrescent City RR. bNew Or. City & Lake RR. guar. Orleans Railroad.	100 100 100	2,000,000 2,000,000	2,000,000 2,000,000	4 % 8., July, '98. 1 % % Q., Oct., 98. 3 % S., Jan., '99. 4 % S., Jan., '99.	148 4 25 01 205	26 s 102
#interprise City RR. Co	100 100 100 100 100 100 100 100 100	1,000,000 12,000,000 10,323,800 10,000,000 15,000,000 15,000,000 500,000 2,000,000 20,000,000 1,250,000	250,000 12,000,000 10,823,800 10,000,000 2,500,000 6,600,000 249,900 1,608,200 624,900	8 % Q., Dec. 81, '98.  8 % Q., Jan., 99.  11% % Q., Feb. 99.		276 91/4 25 76 22)  1.0	St. Charles Street Railway.  New Yopk—Mar 12 Centrai Crosstown RK  cChristopher & 10th Sts. RRguar Dry Dock, E. Brdw'y & Battery RR dMetropolitan Street Ry. Co  cBleecker St. & Fulton Fy. Ry. guar gCen. Park, N. & E. Rivers RR. guar a Eighth Avenue RR  i42d St. & Grand St. Ferry RR. guar jNinth Avenue RR  guar kStxth Avenue RR	. 100 . 100 . 100 . 100 . 100 . 100 . 100 . 100 . 100	1,000,000 600,000 650,000 1,200,000 900,000 2,100,000 1,800,000 1,900,000 750,000 800,000	600,000 650,000 1,200,000 80,000,000 900,000 1,800,000 1,000,000 748,000 800,000	4¼ % Q.	3) 195 90 395 196	280 1741 50
Cincinnati, Ohio.—Mar 12: Cincinnati Inc. Plane Bycom Cincinnati Inc. Plane Rypfd Cincinnati, Newport & Cov. St. Ry. (Oncinnati Street Ry. Co	100	1,000,000 150,000 4,000,000 18,000,000 2,500,000	575,000 150,000 8,500,000 14,000,000 2,200,000	%% Feb., '99. ½% Feb., '98. ½% Q., Jan., '98. ½% Q., Jan., '98.	83 124 %	89. 12)	Trwenty-third St. R. R. Co., guar Second Avenue RR. Third Avenue RR. m42d St., Manhatv'le & St. Nich. Avenue (Hucki-berry) Ry. Newark N. J.—Mar 12; Consolidated Traction Co. of N. J. North Jersey Street Railway Co United Electric Co. of New Jersey	100 100 100 100 100	2,500,000 12,000,000 2,500,000 2,000,000 15,000,000 6,000,000	1,862,000 10,000,000 2,500,000 2,000,000 15,000,000 6,000,000	***************************************	594 2(0 675% 76 190 60 25 24	4 0 105 57% 52 200 6)1% 26 2)
A gron, Bed. & Olev. Mee. By Oleveland City By Detroit, Mich.—Mar 12 Actroit Citizens' Street By Ft. Wayne & Belle Isle By. Rapid Railway Co Detroit Electric Railway	100	8,000,000 12,000,000 2,000,000	1,250,000 1,200,000 250,000	**********	48 99 % 90 100 % 175 90	50 100½ 91	Pittsburg, Pa.—Mar 12: Allegheny traction Cocom. Consolidated Traction Copid. pCentral Traction Copid. pCitizens Traction Co rDuquesne Traction Co	50 50 50 50 50	500,000 15,000,000 15,000,000 1,500,000 8,000,000 8,000,000	500,000 15,000,000 15,000,000 18,000,000 18,000,000	2 %, Jan., '95. 3 %, Nov. '98. 1 % Nov. 7, '98. 6 % A.	56 277 65 69 10	56 .8 6:1 70 71
Wyandotte & Detroit River Ry  Dayton O.—Mar 12  uity Railway Co	100	1,000,000 250,000 1,500,000 600,000	1,000,000 200,000 1,470,600 600,000	!¼ % Q. !% % Q.	140 170 114	110 145 115	sPittsburg Traction Co. Fed :rai St. & Pleasant Valley Ry. Pgh., Allegheny & Man. Trac. Co. Pittsburg & Birmingham Trac. Ry. Pittsburg & West End Ry. United Traction Co	50 25 50	2,500,000 1,400,000 8,000,900 8,000,000 1,500,000 17,000,000	1,900,000 1,400,000 12,994,889 8,000,000 1,500,000	83: %, Nov. 7, '98, 23/2 %, July, '98, 2 %, Aug., '96, 1 %, Oct. '98, 5 % A., June 80, 98	26) 4 41  12 49	27 ; 42 ; 18 50

\*Unlisted. † Ex div.
a The United Rallways & Electric Company comprises in its organization the Baltimore Onsol dated Rallway Company, the Baltimore Oity Passenger Rallway Company, all the lines of street railway operated by the se companies, and also the Central Railway Coof Baltimore. The pref stock of U. R. & E. ec. Co. has been issued in the form of income bond. b Leased to Booklyn Rapid Transit Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Brooklyn Rapid Transit Company.
d Leased to Brooklyn Rapid Transit Company; road operated by Brooklyn Rapid Transit Company; road operated by Brooklyn Rapid Transit Company; road operated by Brooklyn Rapid Transit Company; road operated by Brooklyn Rapid Transit Oomnany; road leased to Rassau E ectric RR g Owned by Atlantic Ave RR and leased to Nassau system.
h \$30 per share on outsianding capital paid as rental by lessee — West Chicago St. RR. Co.; 2250 100 of stock owned by North Chicago Street Railway, Chicago Passenger Railway,
West Chicago Breet Railroad Tunnel Company.
i Controls by lease Chicago West Division Railway, Chicago Passenger Railway,
35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street
Railroad Company; \$625,100 of stock owned by West Chicago Street Railroad Company; 5 % on \$1,0

Majority of stock owned by Chicago Street Railway Company, lessee.
Clindinati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

- \*Unitsted. † Full paid. † Outstanding. † Ex-div.

  a Leased to New Orleans Traction Company at 8% on stock.

  b Leased to New Orleans Traction Company at 8% on stock.

  c Leased to New Orleans Traction Company at 8% on stock and interest on bonds.

  d Operating the former Met. Trac. system, that corporation having become extinct.

  c Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

  f Leased to Houston, West Street & Payonia Ferry—now Metropolitan Street Railway

  g Leased to Metropolitan Street Ry. at 8% on stock until Oct. 1. 1897; thereafter 9%.

  h Leased to Metropolitan Street Ry. at 8% on stock until Oct. 1. 1897; thereafter 9%.

  h Leased to Metropolitan Street Ry. for 99 years from Jan 1, 1893, at £215,000 per annum.

  i Leased to Metropolitan Street Railway for 18% on stock

  j Leased to Metropolitan Street Railway for \$15,000 per annum.

  Leased to Metropolitan Street Railway for \$15,000 per annum.

  Leased to Metropolitan Street Railway for \$15,000 per annum.

  Leased to Metropolitan Street Railway for 18% on capital stock.

  m Outrolled by Third Avenue Railroad by purchase.

  n Dividends of 1½% yearly guaranteed by Consolidated Traction Company.

  o Controls by lease the Alleg'ny, Cent., Oitizens' Duqueene, Fort Pitt & Pitt'n Traction.

  p Leased to Consolidated Traction Company for 8% on \$3,000,000 capital stock.

  r Leased to Consolidated Traction Company for 8% on sapital stock.

  s Leased to Consolidated Traction Company for 7% on capital stock.



### PASSENGER RAILWAYS.

### TELEPHONE AND TELEGRAPH COS.

					ī	II	1			1	1	T	
NAME.	Par	Capital Authors'd		Rave and Date of Last Div.	EM.	Asked.	Name.	Par	Capital Authors'd		Rate and Date of Last Div.	Bid.	Asked
New Bedford Mass-Mar 12 UnionStreet Kailway Co Northampton, Mass-Mar 15	100	\$850,000	\$850,000	2 %, Feb. 98.	160	165	Boston, Mass.— Mar 12. American Bell Telephone Uo Erie Telegraph & Telephone Co New Rugland Telephone Co	100 100	50,000,000	28,650,000	1 % % Q., Jan., '99. 1 % Q., Feb. 20, '99 \$1.50 p. sh. Feb '99.	813 1 16	81434 117 140
Northampton Street Rv	100	800,000	225,000	4 % A., June '98.	170	178	New YorkMar 12:	ļ					
Omaha, NebMar 12.	100	5,000,000	5,000,000	8 % A. and N.	58	65	American Telegraph & Cable Co *Central & South Am. Teleg. Co	100	14,000,000	14,000,000	1% % Q 1% % Q. 1% % Q. 1% % S. 1% % Q. 1% % Q. 1% % Q.	98 107	96 109
Paterson, N. JMar 12		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	-,,	, <u> </u>			*Commercial Cable Co	100	10,000,000	10,000,000	1888	165	150
Paterson Ry. Co	100	1,250,000	1,250,000	*********	54		Erie Telegraph & Telephone Co *Gold & Stock Telg. Coguar. 6 %.	100	5,000,000	4,800,000	3. Feb., '99.	112	118
Providence, R. I Mar 12 United Traction & Electric Co	100	8,000.000	8.000.000	34 %, Oct. '98	109	112	*International Ocean Tel Co.guar6% Mexican Telephone Co	100	8,000,000 2,000,000	• • • • • •	1222	116	เมื่อ
PhiladelphiaMar 12							*New York & New Jersey Tel. Co *Pacific & Atlantic Telegguar. 4 %	100		8,728,000	2 % % Q., Jan., '99. 2 % 8.	150	175
Hestonville, Man. & Fairmount	50	2,000,000 1,966,100	1,770,000 11,966,100	2 %, Dec. '97. 2% %, July 15, '98.	28 47	24 48	*Postal Telegraph Cable Co *Sout'n & Atlantic Telg. Oo.guar.5 %	100 25		15,000,000	1 % Q.	15	:00
hest'nvi'e, Man. & Fairm't6 % pfd. aFairmount Pk. & Had. Pass. Ry.	50	588,900 800,000	\$588,900 800,000	2%, %, July 15, '98, 8 % S—July, '98, 8 % Feb. 1, '98.	75 75	76 76	†Commercial Union Telegraph Co	25	500,000	500,000 97,870,000	2½ % 8. 8 % 8., Jan., '99. 1½ %, Q., Jan. '99.		116
Onion Traction Co \$12% pd eBlectric Traction Co	50	50,000,000	29,980,450 8,297,920		35%	8,34	†Div. guar. by Postal Teleg. Co.				2,0,0,0,0		
dOitizens' Passenger Ry errankford & Southwark Pas. R	50 50		†192,500	\$8 share Q. \$14 sha'e A—Apr.98	345 45	451	Miscellaneous.—Mar 12: American Dist. Teleg. (Phila.)	25	400,000		1 % Q.	21	84
Lehigh Avenue Ry. Co	25		1.000.000	A. & O.	90	90%	Bell Teleph. Co. (of Canada.)	100 100	8,960,000	8,561,000	2 % 8.	189 65	70
descond & Third Streets Ry	50 50	10,000,000	<b>†6,000,00</b> 0	89 share A, Mar. 98 8 %, A., April, '98.	***	::.	Chicago Telephone Co	100 100	750,000	750,030	••••	:00 :48	3เป 150
guermantown Passenger Ry	50 50	500,000	150,000	3 % Jan., 1898.	144 151	145 152	Empire & Bay States Telegraph Co. Hudson River Telephone Co	100	2,000,000	•••••		75 117	76 20
hPeople's Passenger Rycom. hPeople's Passenger Rypid.	25	750,000	277,402				*Northwestern Telegraph Coguar Providence (R. I.) Teleph. Co	50 50	2,500,000	2,000,000 2,500,000	21/4 % Q.	117 84%	12) 95
(Philadelphia Traction Co	50		1400,000	\$2 p. sh., Oct. 98. 6 % A—Mar., '98.	95	961/4	Southern New Eng. Teleph. Co	100	8,000,000				1
Continental Pass. Ryguar.	50 50	600,000	1600.000/	\$6 share—July, '98.		157	ELECTRIC LIGHT	N.	DELE	EOTR	CAL MFQ	. 0	<u>08.</u>
Philadelphia City Pass. Ry Philadelphia & Gray's Fy. RR		1,000,000	298.650	\$7.50 share July '98 \$8.50 share July '98	100	203	Boston, MassMar 12:						
Ridge Avenue Passenger Ry	50 50		1200 000	812 share, July '98. \$2 share July, '98.		••	Fort Wayne Electric trust receipts Ft. Wayne Elec Co. T. Sec. Series A.	25	40.000.000		••	115 85	125 4J
17th & 19th Sts. Pass. Ry. guar Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	1835.000	1½ % S., July, '98. 811 sh. A., July, '98	300	••	deneral Electric Co. [old] com. General Electric Co. [new]	100	18,276,000	18,276,000	2 % Q., Aug., 1898. 1% % Q., May '99.	1263/4	
junion Passenger Ry. Co , West Philadelphia Pass. Rv	50 50		1900,000 1750,000	#9.50 shre, July '98 #10 share, July '98	25J	240	TH. Elec. CoT. Secur., Series D. Westinghouse Elec. & Mig.Co.com.	50	4 000 000	146,700	187 87 O Tom 100	2> <sub>0</sub> 48	4834
Rochester, N. YMar 12:							Westinghouse El. & Mig. Co. pid. Westinghouse El. & Mig. Co. assent.	50 50	4,000,000 11,000,000	8,195,126	1% % Q., Jan., '99.	61 42	91
Reading, PaMar 12	100	5,000,000	5,000,000	*****	1754	20	New York.—Mar 12: Edison Elec. Ill'g Co., New York	100	9,188.000	7,988,000		119	120
j semuluk l'raction Co		1,000,000	1,000,000	Semi-an.,Jan. & Jy	24	26	*Edison Elec. Ill'g Co., Brooklyn Edison Ore Milling Co	100 100	4,000,000	2,000,000	11/4 % Oct., '98.	8	12
City Passenger Ry	50 50		850,000 \$1,000,000	Jan., '98. Jan., '98.	188 70		Electric Vehicle Oocom.	••	40,000,000	20 460 000	 2 % Q., Aug , 1898,	82	92
St. Louis Mo Mar 12							General Electric Oo. [new] " Interior Conduit & Insulation Co			18,276,000	1½ % Q., May '99.	126%	12:7/8
Fourth Street & Arbeitai My Jenerson Avenue By. Co	50	400,000	150,000 400,000	2 % Dec., 1888.		••	Kings Co. El. L. & P. Co	100		2,500,000	A. & O.	110	125
Lindell Ry		2,500,000	2,400,000 2,479,000	2 % Dec., 1888. 1 % % Jan., '99. 1 % % Jan. '99.	::	::	Pittsburg, PaMar 12 Allegheny County Light Co	100	500,000	500,000	J. & J.	168	173
Cass Avenue & Fair Grounds Oitizens' RR	100		1.500,000	4 %. Oct., '98.		::	East End Electric Light Co	50	800,000	800,000	9	••	
St. Louis RR	50	2,400,000	2,000,000	1½ % Jan., '99.	••	::	Philadelphia, Pa.—Mar 12 Edison Electric Light Co	100	2,000,000	=		'41	141.5
Bouthern Electric Rycom.	50	500,000	500,000	50c., Dec., '89.	25	80 80	*Electric Storage Battery Cocom. *Electric Storage Battery Copfd.	100 100	8,500,000 5,000,000		******	93 93	931/8
Bt. Louis & Suburban Ry 6 % pref.	100	2,500,000	2 500 000	3 %, Jan., '99.	77 68	រំប័	Northern Elec. Light & Power Co Southern Elec. Light & Power Co	10 10	550,000 187,500	550,000 187,500	••••	18 8U	13%
Union Depot RRSan Francisco, Cal Mar.	100	4,000,000	4,000,000	8 % A., July, '95.	••		MiscellaneousMar 12:			,,			j L
California St. Cable KK	100 100			50c. monthly. \$2.50 share, '96.	117	119	Bridgeport (Conn.) Elec. Lt. Co Missouri-Edison (St. Louis)com.	25	500,000		••••	47 25	43 46 14
Market Street Ry	100	18,750,000	18,750,000	Q., 60c. per share.	611/2	68¾ 10	Eddy Electric Mfg. Co Hartford (Conn.) Elec. Light Co	25 100	850,000		••••	10 156	169
Scranton Pa - Mar 12	100	1,000,000	300,000	******			New Haven (Conn.) Lt. & Power Co	25 100		•••••	••••	6 195	10
Beranton Railway Co	50 100		2,500,000 500,000		29 16%	80	Narragansett (Prov., R.I.) Elec. Co. Rhode Island Elec. Protec. Co	50 100	1,200,000		2 % Q., Oct., '98.	98 1144∢	
m Scranton & Pittston Traction Co			1,050,000				Royal Elec. Co. (Montreal)		1,000,000 1,085,000	1,085,030		184 ¼ 18 i	.85
Springileld III Mar 12: bpringfield Consolidated By	100	750,000	750,000	*********			Thomson-Houston Welding Co Woonsocket (R. I.) Electric Co	100 100		•••••	8 % 8, Dec. 1, 96.	106	106
Springfield OMar 12			,,,,,,,,	•			†On Aug. 17 last by a majority vot to \$20,827,200, of which \$18,276,000 is c	omr	non and \$2	,551,200 pi	eferred.	į Ex	di▼.
springfield Street By	100	1,000,000	1,000,000	********	-	11	Recently acquired the Edison Ill pany, the Municipal Electric Light	umii	nating Co.	of Brook	lyn and its constit	iuent	. com-
Springfield, Mass.—Mar 12: Springfield Street Ry	100	1,200,000	1,166,700	1 <b>% A.</b>	207	212	ALLIE	D	INDU	BTRIE	8.		
Foronto CanadaMar 12			, .	_	,,,,,		Boston Mass.—Mar 12.	I	1		1		
Toronto Street Ry	100	6,000,000 4,000,000			100½ 304¾	10 % 30 4	Delaware Gas Light Cocom. Delaware Gas Light Copref.	50 50		500,000 200,0.0	J. & J. J. & J.	72% 96	
Washington, D. CMar 12:	_		, ,	-			American Electric Heating Oo Street Ry. & Illu'g Propertiespfd	50	10,000,000 4,500,000		\$2 p. sh. Jan. 26, '99		-
Deit Ry. Co		112,000,000	12,000,000	65c. per sh, Oct. 97.	\5	98	United Electric Securities Copfd.			1,000,000	\$8.50 p sb. Nov '98.	:-	100
Lokington & Soldiers' Home Ky	50 50	707,000	652,000		85	40	New York.—Mar 12: Consolidated Electric Storage Co						
Georgetown & Tenallytown Ry wetropolitan RR. Co	50 50		200,000	2½ % <b>Q.</b>	15	16	Safety Car Heating & Lighting Co Worthington Pump Cocom.	100	F F00 000	 F 500 000		ر50 8	12
Worcester, Mass Mar 12:							Worthington Pump Copfd	100 100	5,500,000 2,000,000	5,500,000 2,000,000	7 % A	109	110
Worcester Traction Cocom. Worcester Traction Co6 % pfd.	100	2,000,000	2,000,000	8 % S., Feb., '98.	23 105	28 106	Philadelphia PaMar 12 Electro Pneumatic Trans. Co	,,	1 500 000			,	١.
Worcester & Suburban Street Ry Wilkesbarre, PaMar 12	100	550,000	542,500	4¾ <b>%</b> , 1897.	•••	85	United Gas Improvement Coscrip. Welsbach Commercial Cocom.	10 50 100	1,500,000 10,000,000		~~	1 614	162
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1%, Jan., '97.	25	29	Welsbach Commercial Copfd Welsbach Light Co	100	500,000		2 X Q	82 40	7 %   55   41
* Unlisted. † Paid in. ‡ Pull							Welsbach Light Oo., Canada	5	525,100 500,000			1174	
a Leased to Hestonville, Mand b Consolidation Electric, Per	ple'	e sand Ph	iladelphia	Traction compan	nies.	Fixed	Fittendi B. I.a.	100	200 000	900 000			l
charges and all indebtedness of Traction Company.				-	a by	Union	Standard Underground Oable Co	190	200,000 1,000,000	200,000 1,000,000	.ä.	175	180
c Practically all shares owned d Lease to Frankford & South	vark	Passenger	non Comp Ry. assu	oany med by Electrie Ti	ractio	n Co.	Miscellaneous Mar 12: *Barney & Smith Oar Cocom.	100		1,000,000		<b>143</b> .	11%
e Leased to Electric Traction ( f Controlled by Frankford & S	outi	Wark PAR	enger Rai	ilway.			*Barney & Smith Car Copfd. Billings & Spencer Co	100		2,500,000	7×	87 1 4 87	104
g Leased to People's Passenger h Majority of stock owned by	Peor	le's Tract	per anare. Ion Compi	any.			Oonsol. Oar Heating Oo	100 100	- 1		1% % Feb. '96	58 115	60 109
i Leased to Union Traction Co j Lease transferred to Union T ii Leased to United Traction C	IA I	on Compa		\$10,000 ma		iace = -	*Pratt & Whitney Cocom.	100 100		••••••		4 47	8 2
jj Leased to United Traction ( p a. \$20,000 in 1809-1900 and \$30 0 0	per	annum th	ereafter,	eio,000 per annum payable semi-annu	ıını ually,	rental.	Stillwell-Bierce Cocom.	100	•••••	••••	2 % Sept 1, 98,	57	5-1 65
declared as a dividend semi-annu- k Dividend of 10 % guaranteed Dividend of 6 % guaranteed	by	Reading Ti	raction Co	ompany.			Shults Belting Co	100	500,000	*******		10	90 106
Leased and operated by the	oy n	ton Railw	ay Co., fo	rmerly Scranton T	ractio	on Co.	Unlisted.					<u> </u>	Ī
							•				1		

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# BONDS.

PASSENGER RAILWAY.							PASSENGER RAILWAY.						
	Amou			Interest				Amo			Leterest		
NAME.	Authorized.	Issued.	Duo	portods.	Bid.	Asked.	NABE.	Antihorized.	Issued.	Die	perfude.	Pid.	Pain
Albany N. Y.  Date of Quotation- Mar 12, 1900 The Albany Ry. Co Cons. mtg. 5s. The Albany Ry. Co Gen. mtg. 5s. Watervieit Turnpike & RR. 1st mtg. 6s Watervieit Turnpike & RR. 2d mtg. 6s. Toy City Railway Co	\$500,000 750,000 850,000 150,000	150,000	1947	M. & N. M. & N. M. & N.	*1161/ <sub>6</sub> *125	127½ 127 127	New Orleans La.  Dote of Quotation- Mar 12, 1500  Canal & Claiborne RB cons mig. 6s. Orescent City RR let mig. 6s. Orescent City RR let mig. 6s. New Orleans City RR let mig. g. 5s. N. Orleans & Carroliton RR. 2d mig. g. 6s. N. Orleans & Carroliton RR. 2d mig. g. 6s. Orleans Railroad Co Cons. mig. 6s. 184: Charles St. RR. Co lst. mig. 6s. 184:28,500 in escrow to retire New Orleans City RR. Co.'s lst mig. bonds. 1890,000 outstanding.  New York.	\$150,000 5,000,000 416,500 5,000,000 850,000 800,000	8,000,000 899,000 2,599,500 850,000 800,000	1899 1948 1908 1948 1907	M. & N. J. & J. J. & D. J. & J. F. & A. J. & J.	1051/ <sub>4</sub> 108 112	111
Date of Quotation- Mar 12.1100 nited Electric Ry. Colst mtg g. 4s.  saltimore City Pass. Rylst mtg, g. 5s. Baltimore Traction Co	1,500,000 1,250,000	1,500,000 1,250,000 1,750,000  117,000 580,000 8,000,000	1949 1911 1929 1901 1942 1900 1906 1912 1932	J & D. M. & N. M. & N. M. & S. J. & D. J. & J. N. & M. J. & J. M. & N.	102 74% 118% 119 104% 121 101 102% 119 116	102¼ 75 120  121½ 	Date of Quotation—Mar 12 1900.  Atlantic Ave. (Brooklyn)Imp. g. 5a. Atlantic Av. (Brooklyn)Istgen. mig. 5s. †Atlantic Av. (Brooklyn)Cons. mig. 5s. †Bro'dway & 7th Avesteons. mig. 5s. †Broadway & 7th Avelst mig. 5s. †Broadway & 7th Ave2d mig. 5s. †Broadway & 7th Ave2d mig. 5s. †Broadway Surface2d mig. 5s. †Broadway Surface2d mig. 5s. †Brooklyn City & Newtownlst mig. 5s. †Brooklyn City & Newtownlst mig. 5s. †Brooklyn Heights RRlst. mig. 5s. †Brooklyn, Q's Co. & Sub'nlst mig. 5s. †Brooklyn, Q's Co. & Sub'nlst mig. 5s. †Brooklyn, Q's Co. & Sub'nlst cons. 5s.	1,500,000 1,125,000 1,000,000 6,000,000 2,000,000 1,000,000 250,000 4,500,000	1,966.000 7,650.000 1,500,000 500,000 1,125.000 6,000,000 2,000,000 448,000 250,000 8,500,000 2,750,000	1909 1981 1948 1904 1914 1924 1905 1941 1989 1983 1941 1941	M. & S. A. & O. J. & D. J. & D. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J.	95 107½ 115 128 104 105 116 115 101 104 112 107	11 11 12 10 11 11 10 11 11 11 11 11 11 11 11 11
## All of the bonds of the above ompanies, marked t, have been asomed by the United Railways & Electic Company.  Boston, Mass.  Date of Quotation— Mar 12, 1000 Lynn & Boston RRlst mig. g. bs Test End Street RyDeben. g. 58.  ### 151,4000 in escrow to retire outstanding bonds of absorbed companies.  Charleston S. C.  Bate of Quotation— Mar 12, 100	5,879,000 8,000,000 2,000,000	8,702,000 8,000,000 2,000,000	11902	J. & D. M. & N. M. & S.	114 104½ 112	115 106 	Brooklyn Kand Transit gold 5s. Bleecker St. & Full'n Fer'y RR. Ist mtg. 7s. Central Crosstown RR Ist mtg. 6s. Coney Island & Brooklyn RR. Ist mtg. 5s. D Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s. Dry Dock, E. Bd'y & Bat'y R. R. scrip 5 %. Eighth Av. RR. Co Cert. indebt. 6 %. 42d St., Man. & St. Nich. Av Ist mtg. 6s. Lex. Ave. & Pav. Ferry RR. Ist mtg. g. 5s. Metropolitan St Ry Oo g. m. cl. tr. g. 5s. Second Avenue Ry Gen. cons. mtg. 5s. Second Avenue Ry Gen. Cons. mtg. 5s.	1,200,000 250,000 250,000 1,000,000 1,000,000 100,000 000 000 ,200,000 1,500,000 12,500,000 1,600,000 1,600,000 1,500,000	5,181,000 1,200,000 250,000 800,000 980,000 1,100,000 1,200,000 1,200,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000	1900 1902 1922 1908 1982 1914 1914 1915 1998 1997 1909 1909	J. & D. M. & N. J. & J. J. & D. F. & A. F. & A. M. & S. J. & J. M. & S. F. & A. J. & J.	109½ 101½ 107 125 101 117 102 108 116½ 89 124 120 178½ 116	10 10 10 10 10 10 10 10 10 10 10 10 10 1
Snterprise Street RRlst mtg. 5s. Charleston City Rylst mtg. 5s. †Controlled by Charleston St. Ry. Co. Chicago III.	500,000 850,000	47,000	1906	J. & J. J. & J.	108		South Ferry RR. Co	5,000,000	2,000,000	1987 1909 1906 1942	J. & J. J. & J. J. & J.	110% 106 118 110	1 1 1 1 1
Date of Quotation—Mar 12, 1800  Licago City Ry	7,500,000 1,500,000 4,040,000 7,574,000 15,000,000 8,171,000 500,000 2,500,000 4,100,000 2,700,000	500,000 7,500,000 750,000 4,040,000 8,781,200 15,000,000 500,000 500,000 2,500,000 8,969,000	1908 1929 1907 1982 1928 1942 1906 1911 1900 1927 1928 1911	F. & A. J. & D. A. & Q. J. & J.	1013/4 	2½ 102  109  96%  111 102 107	bonds.  184,850,000 in escrow to retire maturing obligations.  18552,000 in escrow to retire list and 2d mix. bonds.  2In treasury, \$80,000.  1I Guar. by Union By. Co.  TOPONTO Canada.  Date of Quotation—Mar 12, 14 00  Montreal St. Ry	.*	800,000 2,200,000		M. & S. M & S.		
Redeemable at option on 60 da. notice. Funded debt assumed by Chicago W. v. By. Co., controlling interest of hich is owned by W. Chicago St. RR. o., lessee.  Subject to call after Oct. 1, 1899, at 10 and interest. Assumed by W. Chicago St. RR. Co.  Cincinnati, O.  Date of Quotation—Mar 12, 1900.  11. Adams & Eden P'k Inlst mtg. 6s. 14. Adams & Eden P'k Inlst mtg. 6s. 15. Adams & Eden P'k Inlst mtg. 6s. 16. Adams & Eden P'k Inlst mtg. 6s. 17. Adams & Eden P'k Inlst mtg. 6s. 18. Oov. & Cin. St. Rylst mtg. 6s. 19. Oov. & Cin. St. Ry	8,000,000 46,000 100,000 581 090	100,000 581,000 250,000	1900 1905 1906 1912	J. & J. A. & O. A. & O. M. & S. M. & S. J. & J.	118 % 108 % 1 14 108 % 12 i % 182 %	1141/ <sub>4</sub> 104 1221/ <sub>2</sub> 187	Continental Pass. Ry	800,000 100,000 150,000 250,000 1,125,000 5,698,210 200,000 1,800,000 100,000 29,785,000 750,000	810,000 200,000 100,000 458,000 867,000 1,018,000 100,000 500,000 29,724,876 246,000 750,000	1909 1900 1898 1901 1905 1911 1912 1948 1910 1917 1908 1906 1926	J, & J. J, & J. J, & J. J, & J.		
Z250,000 reserved to retire lest mig. bds.  Cleveland, O.  Date of Quotation— Mar 12, 1900  rooklyn Street RR, Oo	2,000,000 8,500,000 1,500,000 1,000,000 600,000 200,000	2,500,000 2,000,000 1,249,000 1,500,000 1,000,000	1922 1909 1918 1918 1910 1922 1915	J. & J. M. & S. M. & N.	106 % 118 % 105 % 106	107 114 h 106 107 	People's Traction lines purchased.  Pittsburg. Pa.  Date of Quotation—Mar 12 1900  Birmingham, Knox & Allentown6s. Central Traction Co	500,000 375,000 1,250,000 1,500,000 50,000 1,250,000 250,000 1,500,000 1,500,000 1,500,000 1,500,000 500,000 500,000 500,000	500,060 875,000 1,250,000 1,500,000 50,000 1,250,000 250,000 1,500,000 1,500,000 2500,000 1,500,000 1,400,000 2,000,000 500,000	981 1980 1927 1980 1918 1942 1928 1924 1929 1922 1980 1984 7918	M. & S. J. & J. A. & O. J. & J. J. & J. M. & N. J. & S. M. & J. A. & O. J. & D. V. & S.	110	10
Date of Quotation—Mar 12, 1500.  setroit Citisens' St. Ry	7,000,000 400,000 1,800,000	8,885,000 877,000 1,800,000	1902	A. & O.	105	102%	Providence R. I.  Date of Quotation—Mar 12, 1(00)  Newport Street Ry	50,000 9,000,000		1910	J. & D.	116	-
*Date of Quotation- Mar 12 1000 www.Haven St. Ry	100,000	600,000 250,000 500,000 24,000	1914 1912	M S J&D M&N M&S	111 111 109		Date of Quotation—Mar 12, 1600 Baden & St. Louis RR1st mtg. 5s. Cass Ave. & Fair Gds Ry 1st mtg. 5s. Citizens' Railway Co1st mtg. 5s. Comp. Hts. Un. De. & Mer. Ter_lst	5000,000 1,600 000 2,000,000 1 000 000	250,010 1,601,000 1,500,000 000 000	1912 1907	J&J	100 3 109 117	1 1 1

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### PASSENGER RAILWAY.

	Amo	unt.				
name.	Authorized.	Isaued.	Due	Interest periods.	Bid.	Askod.
St. Louis.	<u>'                                    </u>	<u>'                                     </u>	<del>' '</del>	Ī		<u></u>
Date of Quotation- Mar 12, 11 00	l		1		1	
Jefferson Avenue Rylst mtg. 5s.	400,000	400,000	1905	M. & N.	103	105
Lindell Ry. Colst mtg. 5s Missouri RB. Co		700,000	1911	F. & A. M. & S.	108 105	106
Mound City BB. Colst mtg. 6s.	400,000	800,000	1910	A. & O.	îco	102
People's RB. Colst mtg. 6s.  People's RB. Co2d mtg. 7s.	75,000	125,000 75.000	1902 1902			•••••
People's RR. CoCons. mtg. 6s. St. Louis & E. St. L. Electriclst mtg. 6s.	1,000,000	800,300 75,000	1904 1905		100	101
t. Louis BR. Colst mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	991%	100 %
St. Louis & Sub. Bylst mtg. g. 5s. t. Louis & Sub. ByIncome 5s.	2,000,000 800,000	1,400,000 800,000		F. & A.	103 80	101 84
†Southern Electric ByCons. mtg. 6s, Taylor Avenue St. Bylst mtg. g. 6s,	500,000 500,000	500,000 500,000	1909		106 116	108 118
Inion Depot RR. Colst cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	1001/4
Inion Depot RB. CoCons. mtg. 6s. †Controlled by St. Louis RB. Co.	8,500,000	1,787,000	1919	J. & J.	121	122
Controlled by Union Depot BR. Co.	ļ		1 1			
Controlled by Lindell BR. Co. 18200,000 in escrow to retire 1st & 2d			1 1			
ntg. - {\$600,000 in escrow.						
††\$200,000 in escrow to retire 1st mtg.						
San Francisco Cal.						
Date of Quotation-Mar, 1900.	1 000 000	<b>2000</b> 0000			'	
alifornia St. Cable BRist mtg. g. 5s. Ferries & Cliff House Rylst mtg. 6s.	1,000,000 650,000	900,000 650,000	1914	J. &t. J. M. &t. S.	114	11 <b>7</b> 11 <b>7</b>
eary St., Park & Ocean BBlst. mtg. 5s. arket St. Cable By. Colst mtg. g. 6s.	1,000,000 8,000,000	671,000 8,000,000	1921	A. & O. J. & J.		95
Ietropolitan Ry. Oolst mtg.	200,000				1263	•••••
emnibus Cable Colst mtg. 6s. Cark & Cliff House RBlst mtg. 6s.	2,000,000 850,000	2,000,000 850,000	1918 1912	A. & O. J. & J.	126 % 105 %	107
ark & Ocean RRlst mtg. 6s.	250,000 700,000	250 000 700,000	1914	J. & J. M. & S.	115	125
owell St. Rylst mig. 6s. ster St. Ry. Colst mig. g. 5s.	1,000,000	900,000	1918	M. & N.		
Controlled by Market St. Ry. Co. Washington D. C.				-		
Date of Quotation- Mar 12, 1900						
elt Ry. Co	500,000 500,000	450,000	1920	J. & J.		• • • •
lumbia Ry'e mtg. 6s. kington & Soldiers' Homa. ' mtg. 6s.	500,000 200,000	500,000 200,000	1911	J. & D.	182	•••••
etropolitan RB. CoColl tr. cons. 6s, \$50,000 in escrow to retire 1st mtg.bds.	500,000	500,000	1901	J. & J.	•••••	•••••
Miscellaneous.					1	
Date of Quetation- Mar 12, 18(0).					- 1	
ridgeport Traction Oclst mtg. 5s. uffalo (N. Y.) Ry. CoOons. mtg. 5s.	2,000,000 5,000,000	1,688,000 8,543,000		J. & J.	108	110
tizens St. R. (Ind polis).181 cons.m.58	4,000,000	8,000,000	1933		118 104	105
Prosstown St. Ry. (Buffalo)lst. mtg.5s. Jolumbus (O.) St. Rylst cons. g. 5s. onsolidated Traction (N. J.)lst mtg.5s	8,000,000 8,000,000	2,366,000 2,261,000		M. & N. J. & J.	112 115	118
onsolidated Traction (N. J.)lst mtg.5s Prosst'n St. Ry. (Colu's, O.)lst mtg.g.5s	15,000,000	18,965,000 572,000	1933	J. & D.	1111/4	1118%
enver City Cable Rylst mtg. g. 6s.	2,000,000 4,000,000	8,800,000	1920	J. & D. J. & J.	115 20	11579
enver Con. Tram'y CoCon. m. g. 5s. ouisville (Ky.) Rylst cons. mtg. g.5s.	4,000,000 6,000,000	922,000 4,981,000	!	A. & O. J. & J.	80 1:9	85 119⅓
Itinneapolis St. Rylst cons. mtg. g. 5s No. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	5,000,000 8,000,000	1,050,000 2,878,000	1919	J. & J.	1101/4	110%
No. Hudson Co. Ry. (N.J.). Cons. mtg. 5s. o. Hudson Co. Ry. (N.J.) 2d mtg. 5s. o. Hudson Co. Ry. (N. J.) Deb. 6s.	550,000	550,000	1928	J. & J. M. & N.	108	•••••
terson (N. J.) RyOons. mtg. g. 6s.	500,000 1,250,000	439,000 1,000,000	1902	F. & A. J. & D.	::::	
ochester (N. Y.) Rylst mtg. 5s. A. Paul City RyOons. g. 5s.	8,000,000 5,500,000	1,000,000 2,000,000 4,298,000	1930	A. & O.		•••••
, Paul Oity By	1,000,000	1,000,000			105¾ 108	106
†\$1,000,000 in escrow to retire 1st and						
i mtg. bds. 1\$800,000 in treasury. Bonds guar, by	ŀ			!	i	
uffalo Ry. Co.				ļ		
\$3760,000 in escrow to retire bonds of .C. St. RR. Co.				i	l	
[\$87,000 in treasury. \$\$960,000 res'ved to redeem prior liens.				1		
*\$520,000 in escrow.						
	l l	!	!	l	·With 1	nt'rest

### ELEOTRIC LIGHT AND ELECTRICAL MFG. COS.

Roston, Mass.		1		{		
Inte of Quotation- Mar 12, 1900		1	1	i	1	
Delaware Gas Lt. Co.,	800,000	800,000		J. & J.	106	******
Edison silec. Illuminating Co., Boston	2,020,000		ì	Quar.	107	<b>.</b>
ieneral Electric Cogold coup, deb. 5s	10,000,000	8,750,000	1922		116	•
Pittsburg Pa		l	i		1	
Ente of Quotation-Mai 12, 1900		ļ	i		i i	
Allegheny County Light Co	500,000		1911	J. & J.	110	
Westinghouse Elec. & Mig. Co. Scrip 6s.	195,570			M. & S.		
Miscellaneous,-(Mar 12, 1900.)			1			
Idison El. Ilig. Co. (N. York) lst m. 5s	4,812,000	4,812,000	1910		109	
dison El. Ilig. Co. (N. Y.) con. m. g. 58.	15,000,000	2,188,000	1993		124	
Idison Elec. Illg. Co. (Brooklyn)	5,000,000	5,000,000	1940		1221/4	121
dison Electric Light (Philadelphia)	2,000,000				l ~ l	
Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,500,000	2,500,000	1937		100	103
Kings Co. El. Lt. & Po. Co. pur money 6s	5.176,000	5,176,000	1997	A&O.	120	122
'tiwankee El. Ry & Lt. Co. lst con. g. 5s.	8,000,000	6,103,000		F. & A.	102	
Unite   Piec. Light & Power Oo(N. Y.)	5,000,000	1	ا ا		1 7	• •

### TELEPHONE AND TELEGRAPH.

Miscellaneous.  Date of Quotation—Mar 12, 1100  American Bell Telephone	••••••	 	F. & A.	100½ 	101
Chesapeake & Potomac Teleph. Co 5s.		 1911	J. & D.	108	106

### ALLIED INDUSTRIES.

Migrellaneous	1 .				
Date of Qu tation-Mar 12, 10	)o				
American Electric Heating		570.070		•••	25
Barney & Smith Car Co	69.			106	107
Carborundum Mfg Co	es.	1904	J & D.	•••••	******
Worthington Pump Co	75,000		••,		
	ominal.				•

### NOTES FOR INVESTORS.

Late quotations for copper are: [Electrolytic, 153@16c.; Lake, 164@16½2.; casting, 15½@15¾c.

The Canadian General Electric Company is applying for letters patent increasing its capital from \$1,200,000 to \$1,500,000.

The United Electric Company is said to be negotiating for the absorption of sixteen lighting companies in Northern New Jersey.

The Commercial Cable Company has declared a quarterly dividend of 12 per cent., payable April 14. Books close March 2) and reopen April 3.

The Cauto River Company, with a capital of \$1,000,000, to operate an electric plant in the West Indian Islands, has been incorporated at Trenton, N. J.

Application has been made to the New York Stock Exchange to list \$5,000,000 additional common stock of the Eric Telephone and Telegraph Company.

The Telephone. Telegraph & Cable Company of America has called for a third payment of 5 per cent., or \$2 50 per share, payable May 1. Par value is \$50.

A dispatch from Tacoma, Wash., states that the Canadian Government will build a 1,000 mile telegraph line connecting the Syaguay-Dawson line at Tagish

The Ridgefield and Teaneck Railroad has been merged with the Bergen County, J.) Traction Company, which operates between Fort Lee Ferry, Englewood and Hackensack, N. J.

The National Power and Manufacturing Company was incorporated in Tren-N. J., on the 8th inst., with a capital of \$2,000,000 to manufacture and sell light, heat and power.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Bat, 15@15; New York Electric Vehicle Transportation, 74@71; New England Transportation, 5@6.

A franchise tax bill has been introduced in the New Jersey Assembly. It imposes upon all persons, companies and corporations operating municipal franchises a tax of 2 per cent. on their gross receipts in addition to the tax to be paid upon tangible property.

Fifteen hundred employes of the St. Louis Transit Company have decided to strike unless their demands are complied with that there shall be no further discharge of motormen and conductors because of their affiliations with the Amalgamated Association of Street Railway Employes.

The report of the National Carbon Company for the year ended Jan. 31, 1900, shows: Net earnings, \$451 687; addition to plants, \$36,177; charged to depreciation, \$63,149; accounts charged of, \$1.414; 7 per cent dividends on preferred stock, \$315,000; balance to profit and loss, \$35,945; total, \$451,687.

The Old Colony Trust Company, of Biston, and the Guaranty Trust & Safe Disposit Company, of Philadelphia will set in the capacity of depositories for the exchange of the Eric Telephone Company stock into the thirty-year 5 per cent. gold bonds of the Telegraph, Telephone and Cable Company of America that is to be secured by the Eric stock.

The Manchester Electric Company has notified the Secretary of State of New Hampshire of an increase in its capital stock from \$600,000 to \$1,000,000. This can be done under its charter without further legislative permission, as under the general law the corporation had the right to issue stock to the amount of \$1,000,000, but had not before availed itself of the full limit of this privilege.

A million dollar mortgage was recorded in the Register of Deeds office, Camden, A million dollar mortgage was recorded in the Register of Deeds office, Camden, N. J., on Friday last. The mortgage was given by the Camden and Burlington Gas and Electric Company to the Fidelity Trust Company, of Newark. The mortgage is secured by five per ceut, bonds on the rights and frauchises of the electric light companies of Merchantville, Moorestown, Haddorfield, Burlington, Mount Holly and the People's Gas Company, of Camden.

Stockholders of the Consolidated Gas Company, with but one dissenting voice, voted on the 9th inst to increase their capital stock from \$39,078,000, consisting of 390,678 shares, to \$54.595,200, consisting of 545.952 shares. The purpose of the stock issue is to retire \$36,000,000 of Consolidated Gas Company debenture bonds, which were issued temporarily last January to acquire \$36,000,000 of the stock of the New York Gas and Electric Light, Heat and Power Company.

President H. H. Vreeland, of the Metropolitan Street Railway Company, has

President H. Uveeland, of the Metropolitan Street Railway Company, has announced that the cable system will be changed to the underground electrical system and that additional lines will be built to cost on the whole probably \$10,000,000. The work of changing the motive power on Columbus and Lexington avenues will begin by the middle of this month and will be completed in three months. Cars will be diverted to Fourth and Six'h avenues. Following this work, the electrical service will be installed on Breadway. Two lines are to be built under the trical service will be installed on Breadway. Two li charter of the Fort George and Eleventh Avenue line.

Referring to the demand for copper Jesse Lewisohn of Lewisohn Brothers is reported as saying: "London is now in the market for a large amount of American copper, thou-ands of tons of it being required for war purposes. Germany and France are also buying liberally. The demand from the latter country can be traced to the construction of telephone systems. Germans need it for traction and manufacturing purposes. It is estimated that one-third of the entire copper production of this country is now being experted."

Receiver Grant's report on the New York Third Avenue Bailroad, presented to Judge Lacombe in the United States Court for the Southern District of New York, makes the following suggestions: "That all contracts be abrogated; that the receiver be author zed to issue certificates of ind but dress to the amount of \$6,000,000 in place of assessing stockholders; that permission be granted to abandon the construction of new work; that permission be given to abandon the building of the new \$5,000,000 power house; that construction work be limited to the completion of track work now under way until the road shall be in a prosperous condition; that the receiver be allowed to give this work to a competent contractor at a fair price." The receiver says that the debt now existing can be funded by an issue of \$5,000,000 in four per cent, bonds." A mechanics lien for \$60,276 61 was filed Monday by the Safety Insulated Wire and Cable Company against the Third Avenue road.

The New England Electric Vehicle & Transportation Company, in circulars to

The New England Electric Vehicle & Transportation Company, in circulars to stockholders under date of March 7th, states: "The New England Electric Vehicle Transportation Company has on hand a sufficient portion of its capital subscribed Transportation Company has on hand a sufficient portion of its capital subscribed to meet all the requirements of its business for some time to come, and it is thought that a large proportion of the stockholders of the company would prefer to have their present holdings of shares fully paid rather than have them assessable by vote of the board of directors. If, in the future, the development of the business requires additional capital, it is always in the power of the corporation to incresse its capital stock, giving the stockholders the right to subscribe for the same, but without imposing any obligation on them to do so. The directors have voted that it is advisable to decrease the authorized capital stock of the said company from \$25,000,000, divided into 250,000 shares of the par value of 100 each, to \$5,000,000, divided into 500,000 shares of the par value of \$10 each, the decrease to be effected by reducing the par value and increasing the number of shares as aforesaid, and by purchasing at par the original twelve shares of fully paid stock of the company of the par value of \$100 each by issuing from the unissued stock in lieu thereof and in payment therefor 120 shares fully paid of the par value of \$10 each. Scockholders will vote upon the question on April 3." Vol. XVIII.

Re

NEW YORK, MARCH 21, 1900.

No. 11.

# **FLECTRICITY**

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### EDITORIAL NOTES.

Profits in the Telephone Business.

The recent absorption of the Erie Telegraph & Telephone Company by the Telephone, Telegraph & Cable Company of

America has brought about probably the greatest change in the telephonic situation that this country has yet seen. Before this consolidation the new independent rival of the Bell Company, although backed by men of influence and financial standing, was having like all new enterprises a hard row to hoe, due to the increasing efforts on the part of the Bell monopoly to throw obstacles in its path. Small independent companies in many parts of the country were either gobbled up by the American Telephone & Telegraph Company at exorbitant figures or were forced out of business, the apparent policy of the moropoly being that of the dog in the manger, namely, "if we can't have you nobody else shall."

By obtaining control of the Erie Company, the independent organization has acquired a property worth in the neighborhood of \$15,000,000, and what is still more important a concern that boasts of some 200,000 subscribers throughout New England and the middle Western States. This means that as soon as companies representing the Telephone, Telegraph & Cable Company of America have gained a foothold in such cities as New York, Chicago, Philadelphia and Boston, it will necessitate comparatively little work, and by no means an enormous outlay of money to furnish an excellent long-distance service covering a large expanse of territory.

That it will take some time for the new company to furnish as complete and extensive a service as that of the American Bell Telephone Company cannot be gainsaid, but that it ultimately will do so is not to be doubted, and when that time does arrive the public may be sure of cheaper rates.

It has been stated at various times that the existing Bell monopoly cannot afford to reduce its rates for service and still leave a fair margin of profit for its stockholders, which argument falls flat in face of the fact that yearly statements have shown a net profit of about 75 per cent. Fifteen per cent, is paid in the form of dividends to the stockholders while an outlet is sought for the remainder in real estate investments.

Referring to the profits of the New York Telephone Company, which as is well known is a lessee of the Bell, the "Commercial Bulletin" recently said:

"When the telephone was originally established in this city its charge was \$60 per year, and when the service had been constituted a monopoly the rate was advanced to \$150 and \$180. This rate is about three times the average charge in places outside of New York. Just what this means is expressed with mathematical precision in the fact that, according to sworn testimony by the officers of the company before a legislative committee in 1887, the corporation made a net profit of 473 per cent. within six years, or nearly 80 per cent. per annum, upon its original capital. This settles the whole question, without need of further evidence, as to the enormity of the monopoly and the boldness of its exactions."

Experience goes to show that whenever an independent telephone company has succeeded in gaining a foothold in a locality previously served by a Bell concern, rates have been reduced through competition to something like a reasonable figure. Such has proved to be the case in Detroit, where rates dropped owing to this cause from \$72 to \$36. Likewise a \$60 a year charge was just cut in half through competition in Richmond, Va., and it may therefore safely be predicted that when the Telephone, Telegraph & Cable Company of America has carried out its extensive plans, that the immense net earnings af the American Bell Telephone Company will be a thing of the past.

The Metropolitan
Controls the
Third Avenue.

The Metropolitan Street Railway Company of New York on Monday secured control of the Third Avenue Railroad,

and as a result all the traction lines in Manhattan and Bronx Boroughs will in future be under one management.

By this purchase interests amounting to more than two hundred million dollars are concerned, and an immediate termination of the Third Avenue receivership is anticipated. President H. H. Vreeland of the Metropolitan Railway will manage the entire system, and he promises many advantages to the public through an extensive system of transfers.

The stockholders and creditors of the Third Avenue Company have just cause for rejoicing that the consolidation has taken place, and the first person to congratulate Mr. Vreeland over the result was Henry Hart, who has been the directing power of the Third Avenue Company since the road was started.

It is to be hoped, however, that the present Grand Jury of New York will be able to discover the parties who wrecked the Third Avenue road, in order that they may receive the punishment they justly deserve.



Electricity as a Propelling Power for Ships.

Several years ago we referred in these columns to the fact that patents had been taken out by a gentleman by

the name of Richard B. Painton on an electrically propelled cruiser. This new departure in the way of steamship propulsion attracted considerable attention at the time, and the Navy Department at Washington is said to have carefully examined into the practicability of the system.

The invention consists in making use of a large number of independent propellers, instead of two or three as is now customary. Mr. Painton proposes to use exceedingly short lengths of shafting, independently operated by means of electric motors, so that in the event of one or more becoming disabled through any mishap there would still be a sufficient number of propellers in working order to drive the vessel through the water at a moderate rate of speed. With this arrangement of machinery the inventor asserts that a speed of forty knots an hour can easily be attained.

As already stated, although Mr. Painton's invention attracted considerable attention when first brought out, it had like many another invention apparently been consigned to oblivion, when interest in it was again recently aroused by the introduction into the House of Representatives at Washington of a bill looking to the appropriation of a sufficient sum of money to allow the Secretary of the Navy to contract for one of these specially designed cruisers.

The plans originally in the hands of the Navy Department called for a vessel some 600 feet in length, which, as may well be imagined, would cost an exceedingly large amount of money to construct, and if this is the vessel the bill now in Congress refers to, we would suggest that haste be made slowly in passing it. We have no desire of placing ourselves on record as endeavoring to restrain progress, but in the case of the cruiser in question-providing our surmises are correct it would certainly seem as though a test of this system of electrical propulsions could be made on a much smaller and more economical scale. That an electrical system of multiple screw propellers for a ship is an experiment may be inferred from the fact that up to the present time the field of usefulness of electrically-operated machinery on shipboard has proven comparatively limited. This is undoubtedly due to the fact that for a given horse power a triple or quadruple expansion steam engine would require less space and probably weigh less than an electrical installation of equal power. On the other hand, as is well known, electricity as an auxiliary motive power has its advantages. In view of the above it would seem much wiser to authorize, say, the construction of an electricallypropelled torpedo boat which would cost but a few hundred thousand dollars rather than a full-sized cruiser or battleship, which would probably entail an expenditure of several millions of dollars.

\* \* \*

Proper Banking Facilities Needed. Since our commercial relations with our new possessions and with South America have grown closer, and now that large quantities of electrical machinery and apparatus are

weekly being shipped to the southern portion of this continent, attention has been called to the need of laws authorizing and regulating banks for the transaction of international and intercolonial banking. In this connection the establishment of a commission to investigate banking and commercial conditions in the new possessions of the United States with a view to obtaining more exact knowledge of the nature of the banking legislation essential to the best interests of these new possessions, and to our own country in its business relations with them, is highly necessary. The past year has emphasized the need of such legislation and it is high time that Congress should recognize the disadvantage at which our country is placed by the lack of proper banking facilities, not only in South American commerce, but in our commerce with our new possessions. The need of banking facilities to care for the rapidly growing business between the United States and the territories over which she now exercises sovereignty is such that of necessity banking institutions have already been established over which there is little or no governmental supervision.

Unless adequate legislation is provided, the American exporter, in his trade with America's own colonies, will be compelled to endure all the disadvantages under which, in all South American markets and in many other markets of the world, he now labors in his competition. with foreigners enjoying superior banking facilities. When, by means of international banks and their branches, the proper banking facilities are afforded those engaged in foreign trade, they transact their business with these banks in much the same manner as the domestic shippers of the United States transacts business with our present banks. American in his South American trade, as compared with the foreigner in the same line of business, is subjected to the same relative disadvantages as are experienced by a domestic shipper without banking facilities, as compared with another who possesses them. Thus, as compared with the English exporter, who, when his goods are shipped, can receive advances from an English international bank upon the credit of his bills of lading and of the foreign consignee, concerning whose credit the home bank, through its foreign branch, is well advised, the American shipper, in the majority of instances, is denied such privileges, and must await entire, instead of partial, reimbursement until the arrival of the goods at the foreign market and the collection of the draft for the purchase price made at the time of shipment. In addition to this disadvantage, the American exporter in his trade with South American countries transacts all his business of consequence through English banks in terms of English money, paying the rates of exchange fixed by these foreign institutions,

The earlier that intelligent and careful consideration can be given by Congress to this important question, the better it will be for the trade relations of this country and to the manufacturers in general.

### UNDER THE SEARCHLIGHT.

### Notes and Comments on Various Topics.

A SUPREME COURT jury has awarded the sum of \$2,300 to one Mary Johnson as compensation due to her from the Nassau Railroad Company, of Brooklyn, N. Y., for injuries sustained under peculiar circumstances. As a result of the sudden stoppage of a car the plaintiff was heavily sat upon by a man unknown to her, but sufficiently indentified as being "a very fat man."

At the 204th meeting of the New York Electrical Society, to be held at the College of the City of New York on the evening of March 22d, the status of automobile development will be dealt with in three papers by Mr. A. L. Riker, Mr. C. J. Field and Mr. J. A. Kingman.

BERNARD M. SHANLEY, head of the contracting firm of B. M. and J. F. Shanley, died Monday in Newark, N. J. He was the promoter of all the trolley, gas and electric deals in Essex and Hudson counties, New Jersey. He was born in Newark in 1847, and was a graduate of the Newark Academy. A widow and three sons by his first wife survive him.

The opening of the first electric line in Mexico was marked by the coinage of a new Spanish word—motorista, for motorman.

A RESIDENT of Worcester, Mass., has invented a new incandescent lamp for which great things are hoped. The filament is starshaped and consists of a combination of asbestos iodine, aluminum and alcohol. The asbestos is saturated in iodine, and coated with aluminum filings. Crystalized alcohol is applied as a dust to the coating of the asbestos, and the thread is then subjected to an enormous heat. The principal usefulness of this lamp, it is thought, will be found on railways in parlor-car lighting where it can be embedded in safety in the walls or ceilings.

PITTSBURG will be represented at the Paris Exposition by the Murphy Manufacturing Company, a new concern. It will be an exhibit of interest to all persons connected with rapid transit, and will consist of a car wheel turning machine. It turns flat wheels without delaying the car from regular service for more than one hour. John Murphy, general superintendent of the United Traction Company lines of Pittsburg, is the inventor. The feature of the machine is that the flat wheel on a car can be put in good condition without its removal from the axle. It was exhibited at the recent convention of the American Street Railway Association. The method of operating is simple. The truck containing a flat wheel is raised from the ground and the machine, which resembles the tail stock of a lathe, pushes forth a center pin against the car wheel axle. An emery wheel is fed toward the periphery of the wheel, and being driven at a high rate of speed uniformly removes all metal which has prevented the rim of the wheel from being round and true. The average life of a car wheel is about 35,000 miles. The ordinary car will run 100 miles each day, making the life of the wheels about 350 days. With this invention the life is increased fully 25 per cent. or about



three months. A. G. LeGrand, an electrical engineer, will erect one of the machines at the Exposition and operate it during the show.

Admiral Dewey has sent to Representative Foss, acting chairman of the House Naval Committee, a report prepared by Lieut. H. H. Caldwell, the Admiral's aide, on the trial of the submarine torpedo boat Holland in the Potomac on the 14th inst. Lieut. Caldwell, who was on board the Holland during the trial, says that there was no accident or hitch of any sort. The mechanism worked easily, the crew was confident and skillful, the slight pitch of the boat on submersion disappeared when she attained the required depth, the torpedo was discharged with the greatest ease, and only a slight shock occurred when it left the tube. There was not the slightest confusion or hesitation in obeying orders. "It is worthy of note," says Lieut. Caldwell, "that from the first immersion the water as seen through the deadlights was entirely opaque, and at the maximum depth it looked entirely black. During the nearly three hours we were in the boat the air was entirely sweet." Lieut. Caldwell expresses the opinion that the duties of the crew could be easily performed by petty officers of the Navy after a short trial. He says also that a determined enemy, with a submarine boat like the Holland, could have made the occupation of Manila Bay by Admiral Dewey's squadron impossible. In this and the other remarks of his aide, Admiral Dewey

A company, to build electric launches, is being organized in Hamilton, Ont., by Mr. S. R. Sintz, of Chicago, Ill., and Mr. A. Ives, of Detroit, Mich. The electric batteries for these launches will be made by the Volta Storage Battery Company, Hamilton.

The co-operative telephone companies, organizing in the rural communities of Western Indiana, are proving successful and are rapidly multiplying. The company at Bowers Station has seventy-five subscribers, and the service last month cost each subscriber but 24 cents. It is said that the monthly service will soon be reduced to 20 cents. These companies have connection with each other, but a small tax is levied on those communicating with patrons of other companies.

By the construction of an important extension, making connection with the Canadian Pacific Railway Telegraph Company's system at Ashcroft, B. C., telegraphic messages will, at no far distant day, be received and dispatched from Dawson City, Yukon territory, to any point in the world. The necessary extension from Atlin, B. C., to Ashcroft, B. C., will be commenced immediately. To give Dawson direct service with Vancouver, B. C., nearly 1,000 miles of wire will be strung. Work on the Atlin-Ashcroft extension was started on the 15th of March.

TWENTY years ago John Grear, the Assistant Law Librarian of Cincinnati, took a notion to clean a 22-caliber revolver, with the usual result that the gun went off, and the ball penetrated the palm of his left hand. Grear, as a consequence, was laid up for forty-eight days, while Dr. P. S. Conner slashed at the hand in every conceivable direction to find the leaden missile. He did not succeed, and finally offered the opinion that the bullet was not there. For nineteen years Grear did not suffer even a

twinge of pain, but latterly he began to experience considerable suffering in that hand. He applied to a local physician, and by means of the X-rays the bit of lead was located. But with the insertion of the probe the bullet was found adhered to the bone, and it required three-quarters of an hour to bring it to the surface.

E. J. Pennington, the airship inventor, who is a native of Wellsboro, Ind., has again been heard from. After many unsuccessful efforts to enlist capitalists in his airship device, he went to London, England, where he promoted an automobile contrivance, and became immensely wealthy from the sale of his patents to English dealers. Last year he returned to America, and he is now located in Chicago. A few days ago the Pennington Aerial Mail, Express and Construction Company, capitalized at \$3,000,000, was incorporated at Chicago. Five well-known Chicago capitalists are backing the movement.

A DISPATCH from Hong Kong states that Governor General Doumer of French-Indo China has started to carry out the plan of connecting the French and Russian telegraph systems in Southeastern Asia. A cable is to be laid to connect Cape St. Jacques, at the mouth of Donhsi River, in Saigon, with Pulo Condor, an island situated eighty miles from the mouth of Mekong River, on the route between Singapore and Bangkok.

A Chicago society woman suggests that stray dogs be electrocuted instead of asphyxiated, as is now customary. The comptroller of that city referring to the plan is reported as saying: "First, you've got to eatch your dog before you kill him. Suppose electricity was used. I suppose a long row of chairs and strapping apparatus would have to be fixed up in the death chamber. Then there would be trouble in getting the dog strapped down, and how and where to apply the current would be the next question. A dog's tail doesn't afford much groundwork for a few thousand volts to pass through. If the shocking machinery was applied to the dog's mouth he might open it at the wrong time and swallow the current. Then what might kill one dog might only make another howl. Altogether I fear we would have a pretty how-dye-do at the dog pound. I am against the plan, though, on the score of increased expense.

Messi: , Siemens & Halske have brought out an improved Leclanché battery, which has all the conveniences of portability which belong to the dry cell, says the "Electrician," London. Within a rectangular or cylindrical cardboard vessel is inserted a zinc vessel of similar shape, whose bottom is made of zinc, or may be made of asphalt material, firmly united to the zinc sides so as to prevent any escape of liquid. Within this zinc vessel is placed the carbon electrode, which is surrounded by a porous depolarizing mass secured to it by a gauze bag. The electrolyte, which consists of a concentrated solution of sal-ammoniac, is contained in the inter-space between the carbon electrode and the zinc vessel, and is scaled hermetically with a layer of asphalt, so that the gases generated in working can only escape into the atmosphere through a gas chamber in the upper part of the cell by passing through the porous depolarizing material on which their passage has a continuous loosening action.

A BILL to create a commission to examine and license those engaged in electrical wiring and engineering has passed the N. Y. Senate and has been referred by the House to the Judiciary Committee. This bill is slipping along rapidly without any particular interest concerning it, but it is a question if it will not seriously increase the cost of wiring and other electrical work, without any compensating advantages.

If the interviews and alleged statements of European engineering visitors to this country can be relied upon, there will be placed within the next twelve months orders for no less than \$30,000,000 to \$32,000,000 worth of machinery and electrical equipment.

THE Canada Atlantic Railway Company has inaugurated a system of electrical clocks at terminal points on their line, which are a long way in advance of the old method of taking proper time. The clocks are run from electric storage batteries, and do not require winding, while time is taken from them all over the line at eleven o'clock A. M. each day.

AT the request of the "Royal Imperial Lower-Austrian Stadtholdership," the Austrian Elektrotechnischer Verein has answered eight questions submitted to it as to the danger of the overhead trolley wire. The committee appointed to draft the answers calls attention to the fact that the overhead network is constructed with a factor of safety of 5, and that thus the wire is no more liable to fall than the component parts of ordinary buildings. Telephone and telegraph wires break more frequently, and where possible they should not be placed over trolley wires. Where this is inevitable, guard nets or insulating wooden guards should be fixed between. Moreover, when a wire does fall, contact with persons is infrequent; and if it does occur usually arises through the person himself taking hold of the wire, and lastly, if such a contact does happen a dangerous shock is highly improbable. As to possible danger to the fire brigade, the committee considers that none exists, as the brigade is to be provided with means for switching off the trolley wire at any of the section boxes.

A BILL has just been introduced into the Dominion Parliament, by Mr. Casey, providing for the establishment in Canada of a Government system of telegraphs as a branch of the public service of the Dominion. It authorizes the Government when Parliament provides the money, to establish a system of Government telegraphs throughout Canada, either by construction of new lines or expropriation of existing lines. The bill provides that the rates shall be uniform throughout the country, a maximum of ten cents for ten words on private messages, and ten cents per 100 words on press telegrams. Mr. Casey instanced the splendid results of the Government system of telegraphs in Great Britain. The discussion brought out some interesting facts in connection with the system already under Government control. It appears that the marine department contemplates connecting the lighthouse station, at Belle Isle, with the mainland on the Labrador coast by means of the Marconi system of wireless telegraphy. Experiments made to establish communication with Sable Island by means of carrier pigeons has failed, and the suggestion is made that the Marconi system should be tested.



### HUDSON RIVER POLYPHASE POWER PLANT.

#### BY FRANK C. PERKINS.

A very interesting polyphase power plant is in operation at Mechanicsville. N. Y., and the accompanying illustration will give the reader a very good idea of the arrangement of the generators and the location of the switchboard and controlling apparatus.

There are, as will be noted, five General Electric polyphase generators in a single line, each having a capacity of 750 kilowatts. They are of the 40 pole type and are operated at a speed of 114 revolutions per minute, generating a potential of 12,000 volts.

The use of polyphase currents for power transmission is now conceded to be the best system under conditions found at Mechanics-ville, and the revolving field type of machine is particularly well adapted to this work, as the stationary armatures allow a winding for very high voltages. As a potential of 12,000 volts was found desirable and that without step-up transformers this type of machine was more easily insulated than the type using revolving armatures. The stationary armature avoids the use of collecting rings for the armature current

below are the measuring instruments, including voltmeters and ammeters for the various machines on the floor below. It will be noticed that the 5 generator panels are provided with high tension, double throw switches, divided by marble barriers, which prevent arcing across from one switch to the next and are found to be very effective.

The regulating mechanism is at the left of each generator on the raised platform. The regulators operate promptly and give very satisfactory results. The gates can be moved through their full travel in six seconds, should the full current be thrown off or on: these governors or regulators are called the Geisler electro-mechanical governors. Each main turbine consists of two parts of 42" horizontal Victor turbines, built by the Stillwell-Bierce & Smith-Vaile Company of Dayton. Ohio. The rating of each set is about 1,000 hp. at 18 ft. head.

The twenty ton crane used for moving the heavy machine and running the entire length of the dynamo room is not shown in the illustration.

Returning to the generators, it may be interesting to note that they deliver a current of 36 amperes at 12,000 volts and operate at 38 cycles per second. The wall at the left separ-



POLYPHASE POWER PLANT AT MECHANICSVILLE, N. Y.

and allows an extremely high insulation to be used.

It has been found possible to obtain from these machines installed, as indicated above a very high commercial efficiency and very close regulation approaching the best direct current machines of largest capacity in this respect.

The machines run very steadily, scarcely any vibration being noticed in operating at full load, this being due to the rigidity of construction and the perfect balancing of the armature. The bearings are self-oiling and self-aligning, which is another important detail of construction, insuring perfect operation.

The temperature of these machines under full load is particularly low, the magnetic circuit and windings being so designed as to produce a low temperature elevation and very little regulation is found necessary under variable load.

The high tension switchboard is mounted on a platform above the machines and is of the regulation, sectional panel type, 9 panels being used, 5 for generators and 2 for feeders. A row of pilot lights are noticed at the top, while just

ates the generators from the turbines. The building is 257 ft. long and each room is somewhat over 30 ft. wide. The power house is only a couple of miles from Mechanicsville, eleven miles from Troy, and about seventeen or eighteen miles from both Albany and Schenectady, and a fine market for the power is thus provided.

### The Automobile's Future.

The Automobile Club of America has lately issued an extremely attractive pamphlet of fifty-six pages in the interest of road agitation. It contains a list of the officers of the club and various addresses delivered before its members in this city last month. The pamphlet is devoted entirely to the improvement of highways in the State of New York, and the leading article is by State Engineer and Surveyor Bond. The States of Massachusetts, New Jersey and Connecticut have expended \$6,573,000 for highway improvements and constructed 910 miles of road, while New York has expended the sum of \$88,000 and built seven and one-half miles of road.

### THE APPLICATIONS OF ELECTRICITY IN MEDICAL AND SURGICAL PRACTICE.\*

BY H. LEWIS JONES, M. D.,

Medical Officer in charge of the Electrical Department in St Bartholomew's Hospital, London.

It was with very great pleasure that I received a communication from your President last autumn, asking me to write you a paper on Medical Electricity. And it is a pleasure to me for several reasons; first, because it is a recognition by the Institution of Electrical Engineers of the existence of their somewhat humble sister, medical electricity; secondly, because it gives me an opportunity of putting on record the position which medical electricity holds at the end of the nineteenth century; and thirdly, because I hope to be able to give you some information which may be new to you.

To a certain extent there is a correspondence between the work of an engineer in the repairing shop and that of a medical man in his practice; and this was brought quite forcibly to my mind a little while ago, when I had occasion to write and ask a member of the Institution kindly to come and advise me with regard to a motor which was in feeble health. When he came, he said that he had been sitting up all night with an engine which was on the point of breaking down. It seemed to me to be closely the kind of work which the medical man is often called to do, substituting only the human being for the machine.

The medical side of electricity has been prominent from the early days of the science. Its physiological effects were among the first observations made. In particular, the experiments of Aldini upon the muscles of recently killed animals seem to have created a deep impression upon the people of his day, and to have held out hopes of the discovery in electricity of valuable healing properties.

It is now one hundred and fifty years since the beginning of medical electricity. During the whole of that time it has had to fight its way in the face of many difficulties, and the most serious of these has been the passive resistance of medical men themselves. The vitality which the subject has shown under adverse circumstances is most significant. Medical electricity advances steadily, and the progress during the last decade has been very great. The commercial application of electricity and its house to house distribution by electric lighting companies have called into existence a large number of new instruments and new methods of treatment, and is helping the spread of the study of medical electricity by simplifying the means of obtaining the current when required. The accumulator has been of great service by affording a trustworthy source of currents for the use of surgeons in their galvano-cauteries and exploring lamp instruments. The discovery of the X-rays and their application to surgery and medicine have also done good to the cause of medical electricity by bringing electrical apparatus into more extended use, and the founding of X-ray departments in hospitals gradually leads to the development of electro-therapeutic departments in places where these are not already in existence. Most of the London hospitals now have electrical departments, and these are of manifest utility. At St. Bartholomew's Hospital we have about six hundred cases referred yearly to the electrical department from all quarters

<sup>\*</sup> Abstract of paper read before the Institution of Electrical Engineers, London, March 8, 1900.



of the hospital, exclusive of the cases for X-ray photography, the numbers of which are even greater, and the results of our treatment will compare favorably with those in any other branch of medical practice.

It is a little difficult to speak on a medical subject before a non-medical audience without incurring the suspicions of those who are always on the alert for signs of unprofessional behavior, and there is no branch of medical practice upon which the flerce light of criticism shines more sharply than upon medical electricity. I shall therefore have nothing to say on such matters as the relation of cases, statements of cures, and so forth, which might be thought to be unsuitable to my audience, but will try to meet you on the common ground of apparatus and methods, and in particular I shall try to lay before you some of the difficulties and problems which arise in the course of our medical work, in the hope that some of them may be solved by the advice and suggestions of those who are here present.

From conversations which I have had at various times with engineering friends, I am disposed to think that the number and extent of the applications of electricity to medical practice are not generally realized by electrical engineers. Indeed, when I have observed any reference at all to medical electricity in the proceedings of this and of kindred societies, the reference has usally been one of disavowal and dislike. I therefore feel that in making the present communication to you, I am undertaking the task of trying to show that electrical applications have a large and legitimate field of usefulness in medical practice: that it is quite possible to practice medical electricity without thereby becoming an outcast, and that the advertisements of electropathic or magnetic appliances do not represent the position of medical electricity any more than, shall we say, Keeley represented all that was best and truest in electrical engineering.

If what I have to say to you may seem to be about trifling matters, I hope you will bear in mind that our unit is the milliampere, while yours is the kilowatt, and that the currents which we handle and use would make but a small figure if their energy were expressed in terms of horse-power. Nevertheless, in the small technical matters which have to do with the management of various kinds of small electrical apparatus, the medical man requires a thorough proficiency, because it is absolutely necessary that he shall be able to make his apparatus work. On that account we may appear, in certain matters, to take elaborate precautions which might seem to you to be hardly necessary. With our coils and batteries we require unfailing methods for increasing or decreasing the current sent through the patient, without stops or jerks. We have to deal with the electric light mains, either direct or alternating, or both. And we have evolved for ourselves a long array of contrivances for utilizing the public supplies of electricity for medical purposes. Small transformers, portable accumulators, resistances to provide slopes of potential, which can be tapped as desired for varying voltages, contrivances for using the mains for all sorts of medical purposes are all enlisted in medical work. The statical machine is also coming again into favor, and to use a statical machine one must know enough about its management to be quite sure that after a patient's arrival there shall be no awkward failure of the machine to excite. Otherwise we are likely to be condemned as not understanding our apparatus, and the patient may be lost. All these little matters can only be learned gradually, and through a course of failures and disappointments, and when they have been learned thoroughly, they constitute a very far claim to the title of electrician.

The use of electricity in the production of hot-air baths with incandescent lamps or electrically heated coils of wire as the source of heat is a development of some promise: while, in the immediate future, we can see the approach of new methods of treatment by the light of the arc lamp. Each of these will demand a fresh extension of the field of electrical operations which the medical man will have to

And now I feel sure that some of you are ready to ask what can be done with all these numerous forms of apparatus. You might be inclined to ask me, as a patient of mine asked me the other day, whether I had ever done anybody any good by electricity.

We will take the simplest things first. No doubt it is familiar to all of you that an electric shock produces a muscular contraction, but possibly you may not all be aware of the extent to which the study of the muscular contractions has been developed. The muscles and their nerves are tested by the application of the induction coil current, and by the direct current of a battery of cells: the effects at opening and at closing of the circuit, the comparison of the action of the positive pole with that of the negative, and the measurement of the current needed to produce visible contractions are all examined, and in this way a system of electrical testing has been devised which affords the most valuable indications in the diagnosis of diseases of the nervous system. An important part of the work in the electrical department of a hospital is the testing and reporting upon cases of injury or disease of the various portions of the nervous system and of the muscles, and the accuracy of the answers given by electrical testing is something to delight one. For exactness and simplicity in its responses, one might compare electrical testing to the processes of measuring with a yard measure or weighing in a pair of scales; and numerous cases, which are quite obscure until tested electrically, become as clear as daylight as soon as the test has been made.

The behavior of a muscle under electrical stimulation is peculiar, and I think it may be useful to describe it. A simple shock, such as a single discharge of an induction coil or of a condenser, or a spark from the prime conductor of a static machine, causes a single muscular twitch, which within certain limits is proportionate to the energy of the discharge; the contraction lasts about one-tenth of a second. A rapid succession of shocks causes a succession of contractions which become fused so that the muscle enters into a permanent state of contraction which lasts as long as the stimuli are applied. Stimulation applied to a nerve causes contraction in its corresponding muscles, and when the stimuli are applied to the muscle itself, it is through the agency of its nerves that the stimulation acts.

With a continuous current the behavior is different. Here there is a twitch at the moment of closing the circuit through the nerve or the muscle. The muscle then remains quiescent and almost completely relaxed, while the current still flows, and another twitch is produced when the circuit is broken. This is the sequence of events with the currents of about five milliamperes which are used for testing. With currents four or five times as strong the muscle enters into permanent contraction with continuous currents. These contractions at make and break may seem to recall the phenomena of electro-magnetic induction, but the analogy is more apparent than real.

In certain kinds of paralysis these reactions change, and all irritability of the muscle to coil currents disappears. Stimulation of the nerves gives no response either to coil or cells, but the contractility of the muscle remains for currents from the cells applied directly, and may be more easily excited than in health, while the contraction itself changes in character from a rapid twitch, lasting one tenth of a second, to a slow, sluggish movement, lasting three times as long.

Stated briefly, the above are the observed facts of what is known as the reaction of degeneration. Its value depends upon the fact that it occurs only when the cause of the paralysis occupies certain definite portions of the nervous system. By its presence or absence we can therefore determine with great nicety the seat of the disease or injury. A point which is not yet explained is why the coil discharge should become ineffective on muscle which retains the power of responding to the battery current. What are the electrical differences between the two modes of stimulation?

Next as to electrical treatment. Progress in medical treatment usually moves along two lines. One of these is based upon experimental physiology, that is to say upon a study of the various processes in healthy tissues, and depends on the application of the facts observed to various morbid states. The other line of advance is by direct experiment in a more or less haphazard manner upon the sick. In medical electricity, as in medicine generally, both these lines have been followed. If we consider the first, we can apply the observed fact that electricity is a stimulus to certain living tissues, by asking how stimulation may be made use of in disease. The fact that electricity is a stimulus is easy to perceive in the case of nerve and muscle, and in the case of the sensory nerves of the body, and it is not difficult to prove that it acts in this way upon all living tissues, and the employment of electricity in disease is very largely in application of this process of stimulation.

Beard and Rockwell in the United States, and Débédat in France have shown experimentally that in young animals the rate of growth can be accelerated by suitable electrification. The former electrified daily two young puppies, and found that they grew faster than those of the same litter which were not electrified. Débédat in the same way proved an increase of weight in certain muscles of rabbits as compared with other non-electrified muscles in the same animals; the latter thus showed a local effect from localized electrification, the former a general effect from general applications, and this division into general and local treatment is a useful one. Thus for general diseases one gives a general treatment, and for local diseases a local application. D'Arsonval, by calorimeter observations and chemical analysis of the expired air, has established the fact that electrification increases the activity of the tissue exchanges of the body. Capriati recently has shown by careful dynamometric researches that the application of electricity to the central nervous system in the form of a continuous current along the spine does undoubtedly increase the muscular power, and that applications to the muscles of a limb have the same effect. In the United States it is becoming fairly common for athletes to undergo electrical treatment when preparing for a contest. General electrification applied to cases of simple failure of nutrition, such as debility after illness, or debility of any kind, produces a rapid improvement in the condition of the patient. In rickets, which is a comparatively simple form of defective nutrition, electrical applications have been shown by many observers to have a very high value. The more complex forms of defective nutrition such as 'rheumatism, gout and diabetes are not yet completely controlled by electricity, but indications are not wanting that in time good results may be expected. Already electricity is doing much for these conditions.

In the field of paralytic conditions there are certain strict limitations to the utility of electrical treatment, and it is here that electricity has lost credit quite undeservedly. People have expected electricity to work miracles, and because it could not do so have condemned it as useless altogether. When paralysis is due to some mechanical obstruction or destructive process in the nerve centers of the brain or the spinal cord, or when it is due to certain progressive degenerations in the quality of those parts, then electricity is powerless to help. So, too, when paralysis is due to a breach of continuity in a nerve trunk, electricity can do nothing until the surgeon has intervened and reunited the severed ends. In the latter case electricity comes in quite properly afterwards to promote the recovery of functions which had fallen into abeyance; in the former the surgeon cannot help, neither can electricity. Therefore it is very important to insist that in paralysis there are cases suitable for electricity and cases which are unsuitable. Happily the number of those which are greatly benefited by electricity is a considerable one.

Another field in which electricity is useful is in the relief of pain. Oftentimes it acts by influencing the circulation in the painful part, and relieving congestion and pressure in the blood-vessels. This I believe to be its mode of action in sciatica, lumbago and rheumatism, and in some neuralgias. At other times it seems to relieve a neuralgic pain by some direct influence upon the nerve-trunk in which the pain is felt. Effects upon the circulation are probably the important factor also in the relief of sprains, and in removing the chronic stiffness which may be felt in or around joints as the result of injury or disease. In this there is scope for considerable development. The good results which can be obtained are undoubted, although it is not generally known that this is the case.

Electricity can also be used to promote the passage of drugs into or through the skin, and this has a few minor applications in medical practice, among others for the introduction of cocaine to produce a local insensibility in minor surgery.

Electrolysis, again, is often useful in many small matters of surgery. It is used almost exclusively as a means of destroying tissue. Small tumors of various kinds can be very conveniently treated by electrolysis. The process is carried out by the introduction of metallic needles into the tumor, the products of electrolysis being thus liberated in contact with the tissue to be destroyed. The chief convenience

is the ease with which one can regulate the strength of current, and the amount of caustic chemical liberated, in exact proportion to the work required to be done. So fine and so delicate an application can be made, that the root of a single hair can be destroyed without leaving any visible scar, and the removal of superfluous hair in this way is a matter for which electrolysis is continually applied. Electrolysis with copper or zinc anodes with the object of procuring the liberation of salts of these metals in the diseased tissues has been recommended abroad, but does not seem to have received much attention in this country.

One of the most encouraging points at the present time in medical electricity is the improved quality of the scientific work which is being done in it. Last year, the French Government having declared the subject to be of public utility, a section of medical electricity was inaugurated at the Boulogne Congress of the French Association for the Advancement of Science. I attended the meetings of the section during the greater part of the Congress and was struck by the number and high scientific quality of the communications which were made in it. It was one of the best attended sections of the whole association. France, indeed, takes a long lead in the subject of medical electricity. They have at the present time three periodicals devoted entirely to the subject, and abundance of material seems continually forthcoming to fill the pages. One of them, the "Archives d'Electricité Médicale," is quite indispensable to students of medical electricity, for in addition to its original matter, it provides its readers with abstracts and a bibliographical index which keeps one in touch with all that is being done in medical electricity all over the world.

The progress in the small matters of detail, particularly with regard to apparatus, which has taken place during the last ten years, is considerable. I say ten years, because that represents the time during which my attention has been specially directed towards medical electricity.

It will be interesting to consider and compare the types of apparatus in common use to-day with those used formerly.

Electrodes.—The current is applied to the body of the patient by means of electrodes. These may be of the most varied forms, particularly with electrodes for internal applica-The cylindrical brass handles fitted with sponges and held, one in each hand, are obsolete or deserve to be, and for most external applications their place is now taken by a plate of flexible metal enclosed in wash-leather and a disk of metal also covered with wash-leather and screwed into a wooden handle. The former is called the indifferent electrode, and serves chiefly to complete the circuit through the patient's body; the other or active electrode is the one which is manipulated and applied over the affected region. For testing, the active electrode is fitted with a closing key. Examples of electrodes and other forms of medical electrical appliances are shown upon the table. Bare metal must never be allowed to touch the skin unless electrolytic, or painful effects are desired. Sores are easily produced in a few minutes by a few milliamperes of current if at any point the metal of the conductor touches the skin directly. For this reason some waterholding material, such as wash-leather, is always used to cover the metallic surfaces of medical electrodes.

The Battery.—The chief requirements in a

medical cell are, that it shall need no attention, and will not spoil on open circuit. The past few years have seen the almost complete disappearance from medical work of open acid cells such as thé Smee cell, the Bunsen and the bichromate cell. Formerly, when electrical treatment had to be carried out by means of ponderous oak boxes filled with cells of one or other of these kinds, the trouble and the dirt associated with them was enough to discourage all except enthusiasts. At the present day the Leclanché cell is the only type of battery which a medical man need consider, and even these are rapidly being abandoned, except for fixed installations, in favor of the modern, cheap and convenient dry cell. With these small dry cells for currents of small magnitude and with a few accumulator cells for those medical purposes which require a current of an ampere or more, as for example for the heating of galvano-cauteries and the illumination of small exploring lamps, the medical man is sufficiently equipped, and is no longer compelled to handle and prepare caustic solutions. Large bichromate batteries still survive in remote districts for the occasional production of large currents, but they are every year becoming less numerous, as secondary cells and the means of charging them from dynamos become more general over the country. All this simplification tends very greatly towards the increased popularity of medical applications of electricity, because perhaps one chief cause of its neglect has been. hitherto, the trouble of the management of the apparatus.

Current from the Mains.-After its introduction into commerce the current of the electric lighting mains was quickly introduced into medical practice, and we make large use of it in the electrical department of St. Bartholomew's, which is connected with the mains of the City of London Electric Lighting Company. The current impulses from the alternating mains have a physiological action resembling those of the induction coil; that is to say, the effect upon nerve and muscle is to produce a permanent contraction so long as the current is applied. But it is superior to the induction coil in being a less violent stimulus to nerve and muscle by reason of the more even and gradual rise and fall of its waves. Larger currents can be borne than from the induction coil, and judging from its effects in a long series of cases, it appears to be more thorough and more useful in its effects. Nearly all the cases formerly treated by the induction coil at the hospital are now treated by the current from the mains, the voltage being lowered to suit the requirements of the case (to about ten volts as an average), and indirectly we have gained largely in that the department is now free from the noise of eight or ten induction coils all vibrating and buzzing at once. Formerly the effect of that noise during a long afternoon was most trying. There is one marked difference in the effect of the alternating current which limits its use, and that is that if applied in the ordinary manner through moistened electrodes to the surface of the skin, it has a peculiar, disagreeable, burning effect. The more thoroughly the skin is moistened the less this is noticed, and when the current is conveyed to the patient through the medium of water, as in a bath, this disagreeable cutaneous effect disappears entirely. Consequently a mode of treatment by means of baths and the sinusoidal current has been developed to a very considerable extent, and with decided advantage to our patients. Large numbers of



our cases are those of paralysis of the upper limbs from injury or disease of the nerves of the upper extremities, and for these we use an arm-bath. The arm-bath is a stoneware trough, of suitable shape, having a metal electrode at each end, it is filled with warm water, into which the patient plunges the forearm The use of hot water as a medium and hand. for conveying electricity to a patient has many advantages. The current is much better borne. and therefore a stronger current can be used. Manipulation of the electrodes and personal handling of the patient is done away with, and the affected part is kept warm during the application. For these reasons we use it largely, and I continue to advocate its use as one which again is likely to increase the popularity of electricity among the medical profession, because it tends to simplify its mode of application. In addition to small local baths for parts of the body, we have a large bath, in which the whole of the body is immersed; and for general morbid conditions, as distinguished from local ones, the electric bath with the induction-coil current, or better still, with the sinusoidal current of the mains, is an extremely useful contrivance.

The Statical Machine.—This form of anparatus-the first introduced into medical practice-is showing very decided signs of a revival. In the United States the statical machine is already very largely employed, and I am told that in New York alone there are no less than three firms busily engaged in turning out statical machines at the rate of two or three a week. Those who are only acquainted with the effects produced by statical machines can have no idea of the difference between small and large instruments of this kind. The effects produced by a large statical machine are most decided, and it is only necessary for one to experience them once to see that treatment by them is by no means a mere treatment through the imagination. The most apparent effects of the statical machine are the profound and peculiar cutaneous sensory stimulation which can be produced by it, and the forcible muscular contractions which can also be produced by it when the administration is in the form of sparks. Its special field of usefulness probably lies, first, in its action as a general excitant; secondly, in conditions of neuralgia and other superficial pains; thirdly, in the conditions of muscular pain. In all these cases it acts quickly and thoroughly. It is quite common to receive a patient stiff and lame from lumbago or muscular rheumatism, and to see him leave in ten or fifteen minutes quite free, for a time at least, from his lameness or his stiffness. All this promises to be extremely valuable. The difficulty of understanding how a simple electrification by the static machine can influence the body makes many of us disinclined to believe that there can be any effect; but after watching cases carefully for some time, I can now say with certainty that some direct action does take place. I have only had a proper static machine for a year and a half. and therefore still feel rather a beginner with it. A very interesting matter is that whereas on the other side of the Atlantic the influencemachine which is used is invariably a modified Holtz's, on this side it is the Wimshurst which is considered the best. The American Holtz machine certainly has been developed into a most beautiful instrument; and, although it has one drawback when compared with the Wimshurst-that of not being self-excitingthat is a point so easily gotten over by means of a small accessory exciting machine in the corner of the case as to have no real importance. Size for size, I am disposed to believe that the Holtz gives a better output than the Wimshurst. It appears to be a more cheaply constructed machine, and needs no counter-shaft nor cross-belts.

The application of high frequency currents to medical practice has not had much extension. In France it is used a little. The currents are taken from the leads connected to ends of the primary helix, and no secondary coil is used. An induction coil is generally used to charge the Leyden-jar condensers of the system. The applications are either by a sort of spark or brush discharge from one terminal to the patient; or the patient lying on a couch if attached to one pole, the other being connected to a sheet of metal under the couch. This is called the condenser bed. Finally the patient may be enclosed in the actual helix connecting the jars, and his body thus made the seat of induced currents by "auto-conduction." Its chief applications have been as a mode of general electrification, but the brush discharge is also applied locally to the skin, and has seemed efficacious in curing certain skin diseases.

Ozone.-The use of electricity for generating ozone for medical purposes is attracting some interest. It is not so much that these applications of ozone are entirely new, as that the apparatus is now becoming sufficiently improved to make its applications easier. But the rapid development of electricity in so many directions of late years has given medical men just at present so many fresh things to handle that ozone in its medical applications is, as it were, waiting until some one has time to attend to it, the workers in medical electricity, in this country at least, are so few.

### MAINTENANCE AND INSPECTION OF AU-TOMATIC ELECTRIC BLOCK SIGNALS.\*

### BY H. S. BALLIET.

In considering the maintenance and inspection of an automatic block system we will treat with one installed as follows:

Double track road-both tracks protected.

All switches and cross-overs leading to the main track, or in the main track, protected by breaking the signal wire of the home signal, through the switch instrument attached to switch points, with a very close adjustment, so as to give a danger indication should the point be partly open, or the switch set wrong.

Track circuit sections from one-half to fiveeighths of a mile in length. Each section equipped with two electro-magnets, one of them being in series with the rails and battery, the other (which is of a higher resistance) being in multiple with the rails and battery at the battery end. Two cells of gravity battery in multiple arc supply the energy for these circults.

One distant and one home signal on each circuit, "normally at danger."

A visual switch indication at each siding or cross-over, "normally at safety."

In order to properly and economically maintain and operate such a system practical repair men and battery-men are required. There should be a repair-man and battery-man to every 15 miles of double track. As nearly as possible the headquarters of these men should

be in the middle of the territory, the same being located where there is a day and night telegraph office. Both of these conditions are required so that they can have free and easy access to the whole territory. On parts of the road where trains are few and fewer stops are made, and on busy parts of the road where infrequent stops are the rule, these men can cover the territory on foot in a short time. Such men should be made to keep with them at all times, while on duty, necessary tools to repair any bond wires which they may notice broken or torn off. Too much care cannot be exercised in keeping good bond wires on all joints and that they may make proper contact in the holes drilled into the rails, so as to cause no high resistance in the sections. These men should do all the bonding, or superintend the work if too much for them to do in person, whether it be ordinary every day repairs, such as renewing rails and frogs, or the relaying of new rails.

### TRACK BATTERY.

Each cell of track battery should be renewed every fourth week, this renewal to consist of setting up an entirely new cell, as may be directed. In order to give satisfactory service these cells should be "patched" the second week after renewal. This is to be done by removing the zinc and thoroughly cleaning it, removing a given quantity of zinc solution and replacing it with clear water. Under some very favorable conditions these rules might safely be made to read "renewal" every six weeks and "patching" every third week. Zincs should have a large surface exposed in these batteries, the four pound circular being about the best. These zincs should not be left in service after they are three-fourths consumed.

No copper should remain in a track battery in continuous service for more than three months. It should be removed and thoroughly dried. The copper collection should be carefully removed, and on some subsequent trip it can again be restored to service.

The blue stone should be carefully washed and screened when washing these cells. All copper collections and refuse should be separated from the blue stone so as to leave it in first class condition.

### SIGNAL BATTERY.

Whenever practicable a given number of gravity signal batteries should be installed in which to use the zincs removed from track batteries. This is more economical than to sell the the small zincs for scrap. In a signal battery these zincs can be used until they are ready to fall apart.

A better plan, however, is to get this material in good condition and turn it over to the telegraph department to use in their locals or mains.

The Gordon No. 1 cell, Excelsior cell, or La-Lande (all 6 x 8) are among the most economical and easiest to maintain on both signal and indicator circuits. They are clean, easily removed and non-freezing, and on account of their long life, great labor savers.

### INSPECTOR OR FOREMAN.

Every division which does not exceed 75 miles of double track should be in charge of an inspector or foreman, such person to have charge of the automatic signal force, which represents the maintenance of the division. All matters relating to maintenance should be handled by him. He should be held directly responsible for the proper working of all apparatus on his division. Where disk signals are in service he should be required to renew all

<sup>\*</sup>Abstract of a paper read before the Railway Signaling Club, March 13, 1900. From the "Railway and Engineering Review."

banners, when they become faded; see that relay contact points are kept clean and have an even and perfect contact at all times; that all relay points break properly; that the adjustment of no instruments is made without his personal supervision or knowledge; that all wires are kept properly fused and protected against lightning; that all ground connections are in perfect order; that all batteries are properly renewed and at the proper time; that all alterations or changes in circuits are done properly so as to be safe and cause no unnecessary stops to traffic. He is also responsible for the hiring of proper men to maintain the system. He should report to the division superintendent and to the signal engineer.

Inspectors should be required to carefully test all circuits with a milliammeter or some other suitable instrument and aim to keep all grounds and high resistances removed from the

### COST OF MAINTENANCE.

Under such a system as described and with a similar maintenance force the very best results will be reached. The following figures show an average cost for the service:

Cost per signal per year (labor and mate.

rial)	\$52.00
Cost per cell of track battery per year	
(material)	2.05
Cost per cell of signal battery per year,	
with indicators (material)	1.60
Cost per cell of signal battery per year,	
without indicators (material)	.90
Cost per cell of signal battery per year,	2.00
gravity cells (material)	2,00

### ELECTRICITY BUILDING OF THE PAN-AMERICAN EXPOSITION.

Elaborate designs have recently been completed for the Electricity Building for the Pan-American Exposition to be held at Buffalo, N. Y.. May 1st to October 31st, 1901. Displays of

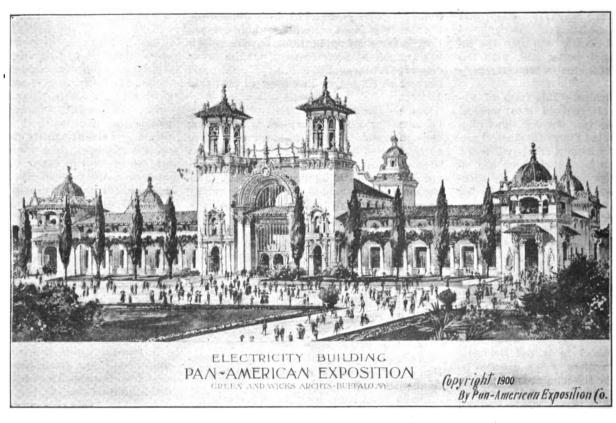
towers also have minor entrances through them.

The connecting work between the towers, the towers themselves, the pavilions at the corners of the buildings, and similar places, are to be brilliantly illuminated and made gay with banners and flags.

The modeled relief work of the building is of choicest design. The general ornamentation of the building is to be frescoes in an interesting mixture of reds, greens and yellows. The general color scheme follows that of the Machinery and Transportation Building and other groups of buildings of the Exposition. The building was designed by Green & Wicks of Buffalo.

### Automobile Lecture and Show.

Mr. James Joyce, Jr., of the Knickerbocker Athletic Club of New York City, has arranged an automobile lecture and show to take



circuits. Too much time cannot be taken to give these matters careful and thorough attention. In this way leaks are detected before they lead to crosses or other defects in the circuits.

INSPECTION.

Inspectors, repairmen and batterymen can make good use of their time while going over their territories by watching the operation of the various relays and signal instruments. Signals should at frequent intervals be tested by using some means of operating the signals and blocking them similar to a train movement. This is essential to finding many troubles and removing them without causing unnecessary stops.

All apparatus should be inspected once every month and a report made showing what defects were found and how remedied. Men should never be allowed to ride on trains, to do as they frequently report, "inspect." There is, however, a time when it is advisable for such a trip, and that is in stormy weather, to see that all signals are clearing properly or to see that lights are properly displayed. When inspecting on foot they are free to carefully scrutize every piece of material or apparatus which helps to make up the system.

all kinds in the practical and artistic uses of electricity, together with complete exhibits of electrical machinery and appliances are to be conspicuous features of the great Exposition.

The designs contemplate a very handsome and commodious building, as shown by the accompanying illustration. The structure is to be 500 feet from east to west and 150 feet wide giving an exhibition space of 75,000 square feet.

The south facade fronts the Mall and the north fronts the Midway. The east end is toward the massive Electric Tower, while the west end faces the Grand Canal. The building is long, low and inviting. The design of the facades shows artistic grouping. The openings of the pergola-like loggias, placed at frequent intervals, present a delightful effect, showing more and more of the reveals of the pllasters and openings as the eye travels to the end of the building farthest away from the observer.

There is a pleasing ending at each corner of the building, with a low-domed pavilion tower, and the building is interrupted at the center by the double-towered entrance. This entrance, wide and high, is spanned by an ornamental arch and supported each side by columns. The

place in the gymnasium at the club on Thursday evening, March 22, to which all members and their friends will be admitted. The lecturer of the evening will be Harold II. Eames, vice-president and manager of an electric vehicle company. After the lecture Mr. Hiram P. Maxim, the well-known inventor and engineer, will give a demonstration of electric and gasoline automobiles, one or two of which will be set up in the gymnasium. Mr. Eames is an authority on automobiles, and as the lecture will be a general one, descriptive of the various classes of automobiles in this country and abroad, it is expected to prove interesting. Ladies and junior members will be admitted.

Contractors are now figuring on the plans for the new works to be built by the National Cycle & Automobile Company at Hamilton, Ont. The premises will be four stories, 66 feet high, with 706 feet frontage, and will be located on Emerald street in that city. The estimated cost of the buildings is placed at \$35,000 The plant to be installed in them will cost \$350,000, and there will be 1,500 incandescent elect ic lights.

# **SOME ELECTRICALLY PROPELLED** VEHICLES.

That there is a constantly growing interest being taken in automobiles is evidenced by the number of horseless carriages in the streets and drives of this city. Some of the most attractive looking vehicles of this description are manufactured by the American Electric Vehicle dust and water-proof enclosed type, having a hollow armature shaft and a single reduction gear between it and the driving wheels. In all the vehicles band brakes operated by foot levers are used, while the direct system of steering with a handle moving a horizontal plane is adopted as being both simplest and most efficacious. The reverse lever is very small, and a single turn of it reverses the motion of the

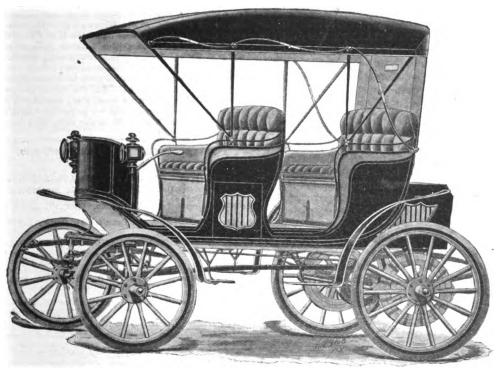


FIG. 1.—AN ELECTRIC SURREY.

Company, formerly of Chicago but now located in New York. Two of these carriages turned out by this well-known concern are shown in the accompanying illustrations. Fig. 1 is an electrically operated "surrey" with seats for four persons, while Fig. 2 shows a six-passenger "break." Both of these vehicles embody many similar features in the electrical equipment.

carriage. This lever is also a safety device and is removable. When the driver descends from the carriage, by simply putting the lever in his pocket he renders the vehicle "fool-proof" to the extent that it is impossible to operate it unless this particular lever is returned to its place.

The motive power makes available brilliant

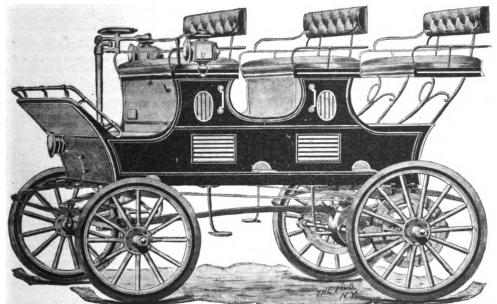


Fig. 2.—Six-Passenger Electric Break.

The running limit on a single charge varies from 30 to 50 miles, according to the condition and grades of the roadway, while the cost of running in all of them is claimed to be about one cent per mile where current is bought at the usual standard rates from electric lighting companies. A single motor equipment is used on all the vehicles, the motor being of a

electric lumps, which add to the safety and beauty of the family carriage, while electrically illuminated signs on the delivery wagons will be appreciated by every merchant or manufacturer using this class of vehicle.

The finish and coloring of the vehicles have been given the greatest attention by the manufacturer.

# CANADIAN NOTES.

(From our Ottawa Correspondent.)

The two companies applying for charters to build an electric railway from Ottawa, through the Winchester district, to some point on the St. Lawrence River, have been amalgamated.

The Vaughn township council, Ont., is considering an application from the Suburban Electric Railway Company for running power through the township to Woodbridge and Schomberg, Ont.

Mr. W. T. Stewart, electrical engineer, of Toronto, Ont., has been engaged to prepare an estimate of the cost of an electric light plant for the town of Toronto Junction, Ont.

It is understood that an application to the Legislature of the Province of New Brunswick, will be renewed for a provincial charter to operate an electric street railway in the towns of Fairville and Carleton, N. B.

Dr. Edward Gahan, of Boston, Mass.. is reported to have purchased the electric light plant of Digby, Nova Scotia. It is his intention to add new dynamos and engine and to give an all-night service.

The Shelburne Power Company of Shelburne, Nova Scotia, is applying to the Legislature of that province for a charter to develop power for electrical purposes on the Rosemay River near the town.

The city of St. Catherines, Ont., is asking the Ontario Government for power to raise \$1.0000, wherewith to acquire water powers to: the development of electric energy, for acquiring land for the erection of buildings, etc., all of which is intended to induce manufacturers to locate in that city.

Mr. Thomas Hawkins, of Montreal, Que., who is well known in Canada in street railway circles, has gone to Georgetown, Demerara, British Guiana, where he will construct an electric plant in that South American city. Mr. Brothers, of Montreal, will also leave shortly for the same place, he having charge of the construction of the electric street railway there in which a number of Montreal capitalists are interested.

A charter has been granted to the Central Ontario Power Company, formed for the purpose of developing electrical energy at Burleigh Falls, Ont., and for the purpose of constructing an electric railway in that vicinity. Among the incorporators are Hon. Richard Harcourt, J. A. Culverwell and F. W. Barrett, of Toronto.

The Montreal Electric Street Company proposes to put its electric wires underground. Mr. Wanklyn, the manager, in a communication to the road committee of the city council, stated that the company had decided to expend some \$200,000 on this conduit system, which has become necessary owing to the large number of cars which the company had to place on the streets to meet the public demand. This con luit system was also necessary for the heavy feeders, otherwise some of the streets would be completely covered with wires. By putting them underground the company also desired to obviate interruptions to the service from such contingencies as fires and the like.

The Great Northwestern Telegraph Company has definitely completed its arrangements with the Dominion Government for transmission of cable and press dispatches to and from places on the Yukon line. The rate from Victoria, B. C., on cablegrams is 33 cents per word to and from places on the Yukon line. The rate from Victoria, B. C., on cablegrams is 33 cents per word and on press dispatches four cents per word, there being in the case of press messages a minimum charge of \$2.50.

#### LONDON NOTES.

[From our London Correspondent ]

### Electric Driving in Locomotive Works

Slowly "very slowly"-British engineering construction works are moving in the direction of the more up-to-date equipment of their factories. The advantages of having a complete electrical power installation in large workshops are now better appreciated than they were a year or two ago. It has been remarked that the British locomotive manufacturer is not in so admirable a position as his transatlantic rivals to turn out locomotives with anything like reasonable speed, or so cheaply, These criticisms may be to some extent responsible for a change which is now being made over to electric driving at two very large locomotive building establishments in Scotland. We refer to the Hyde Park Works of Messrs. Neilson, Reid & Co., and the Atlas Locomotive Works of Messrs. Sharpe, Stewart & Co. The estimates which have been prepared in connection with these two installations show that in one works an annual saving in the coal bill is anticipated to the tune of £3,000, while at the other works it is still greater.

#### The Electric "Underground" to the City

The Board of Trade has passed, and it has now been opened for public traffic, the extension of the City & South London Electric Railway to Moorgate street in the city. The old terminus at King William street is now closed, as the new tunnels which run to Moorgate street are constructed at some depth below this.

#### The Electric Lighting of London.

It may be interesting to mention that London electricity supply companies are prospering by leaps and bounds. It is true that in some instances the companies have had to face smoke nuisance prosecutions, higherpriced fuel, threatened competition, breakdowns and so on, but all the reports issued thus far by companies for 1899 show increased profits distributed amongst the stockholders. The Charing Cross and Strand Electricity Supply Corporation paid 9 per cent. for 1899 against 8 per cent. in 1898; the Notting Hill Company 7 per cent. against 6 per cent. in 1898; St. James' and Pall Mall Company 14½ per cent. (same as for 1897 and 1898); the Westminster Electric Supply Corporation 13 per cent. compared with 12 per cent. for 1898; the Chelsea Electricity Supply, 6 per cent.

# LEGAL NOTES.

The Rolfe Electric Company and the Eureka Electric Company have brought suit against the Sterling Electric Company of Lafayette, Ind., Frank B. Cook, W. E. Doolittle, Mortimer Levering and C. M. Murdock, officers of that company. The suit is brought to enjoin the Sterling Electric Company and its officers from manufacturing the Sterling protectors. The Rolfe and Eureka companies own and control patents covering broadly protective devices for telephone and telegraph circuits, cables, cable heads and the like, which patents the Sterling protectors infringe. It is the intention of the Rolfe and Eureka companies to push this suit against the Sterling Company, and also to prosecute users of Sterling protectors for infringement of these patents.

Justice Lawrence, of the Supreme Court, has appointed John H. Cheever receiver of the

Vance Electric Company, electrical contractors at 136 Liberty street, New York City, on the application of Directors Arthur S. Vance, John H. Cheever and Oscar C. Bocot, in proceedings for the voluntary dissolution of the corpora-

Last week Justice Lawrence, in the Supreme Court of New York City, handed down a decision in the National Light and Power Company case, in which three Philadelphians allege that an attempt is being made to defraud them in a transaction involving \$25,000. They charge collusion between John Post, the plaintiff, in a suit to get possession of the money, and Edward S. Savage, one of the defendants, who was made trustee of the \$25,000 trust fund. An order had been granted to the Philadelphians through their attorney, C. J. McDermott, for the examination of Mr. Savage before a referee. Savage appealed from this order and asked Justice Lawrence to stay the reference pending the decision on his appeal. The Justice said that the stay would be granted if Mr. Savage brought the money in dispute into the jurisdiction of the court. Mr. McDermott had previously made a motion before Justice Beekman asking that this be done. It was asserted then that Mr. Savage had deposited the money in the Union County Bank of Rahway, N. J., which is now in liquidation. Justice Beekman had not handed down his decision when Justice Lawrence entered his order.

#### PERSONAL MENTION.

Mr. Robert T. Fowler, of the electrical department of the New Haven (Conn.) Railroad, has resigned his position and accepted a place with the firm of L. C. Gillespie, a prominent importer of New York City.

Mr. James G. Smith, joint inventor with Stephen B. Stearns of the duplex system of telegraphy, died at his home in New York City last week at the age of 63.

Mr. Mormoru Jio. a Japanese graduate of the department of electrical engineering at Kansas State University has recently been appointed superintendent of a proposed system of electric railways between cities in Japan.

Senator George L. Wellington has lately been elected president of the Cumberland (Md.) Street Railroad Company, which has purchased the Edison and Westinghouse interests in the Edison Electric Illuminating Company of Cumberland.

Mr. Albert Cooper Seibold, a resident of Mount Vernon, N. Y., who had invented an electrical device for propelling canal boats, and also an enclosed arc lamp that he claimed would burn 500 hours, died recently.

## INCORPORATIONS.

The Elyria Plumbing, Heating & Electric Company, Elyria, O.-to deal in electrical and plumbing supplies. Incorporators: Earle Wurst and Edward B. Gale.

The McMullin Motive Power & Construction Company, Chicago, Ill.-to manufacture motors, engines, etc. stock, \$300,000. Incorporators: F. R. McMullin, J. H. Hazard and W. N. Fitzpatrick, all of Chicago.

The Union Electric Manufacturing Company, Portland, Me. -to manufacture and deal in electrical apparatus. Capital stock, \$200,000. Incorporators: A. D. Boyd, J. K. Knapp J. R. P. Rogers, of South Portland; E. W. Dodge, L. F. Jordan, C. E. Bailey, E. Harlow, Jr., C. F. Long, of Portland; B. G. Ward, attorney, Portland.

The Central Traction Company, Indianapolis, Ind.-to build an electric line from Indianapolis to Kokomo. Capital stock \$1,200,000. Incorporators: H.C. Stillwell and G. Lilly of Anderson, and others.

The Oil Belt Traction Company, Huntington, Ind.-to construct and operate an electric road from Huntington through several counties. Capital stock. \$1,000,000.

The C. R. Fish Company, Portland, Me.-to do a general electrical business. Capital stock, \$50,000. Incorporators: H. Mulholland and J. S. Keenan, both of Boston; C. R. Fish, of Cambridge; S. C. Perry, attorney, Portland,

The Denver City Electric Company, Denver, Col. - to fur nish light and power in the city of Denver and vicinity and the incorporation is to last 20 years. Capital stock, \$500,000. Incorporators: Horace W. Bennett, Milton Smith, William Church, T. J. O'Donnell, Julius Myers, Gilbert, Wilkes and

The Pearsall Pneumatic Tube & Power Company, New Capital stock, \$22,000. Directors: Albert W. Pearsall and Adolph Reisenberg of New York City.

#### ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FORRIGN PATENTS at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N.W., Washington, D.C., who has been identified with this work before the U.S. Palent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all informa tion regarding the cost of United States and Foreign Patents trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon pay ment of ten cents. When ordering give name, date and title of invention wanted.

#### LETTERS PATENT ISSUED MARCH 18, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

645,186. Trolley-Head. Edgar J. Rauch, Brockton, Mass. Filed May 24, 1839.
645,259. Electric Third-Rail System. George C. Hicks, Chicago, Ill. Filed July 10, 1839.
645,351. Trolley. Thomas Dennis, New Castle, Pa. Filed July 22, 1899.

#### ELECTRIC LIGHTS AND APPLIANCES

645,244. Manufacture of Incandescent or Other Lamp Globes. Walter C. Fusner. Allegheny, Pa. Filed Dec. 9, 1899.

Walter C. Fusner, Allegheny, Pa. Filed Dec. 9, 1899, 212. Electric Lighting Apparatus for Railroad-Cars. Edwin J. Preston and Arthur B. Gill, London, Eng., assignors to the J. Stone & Company, same place. Filed Jan. 2, 1900.

216. Electric-Lighting Apparatus for Railroad-Cars. Willard F. Richards, Buffalo, N. Y., assignor to Charles M. Gould, New York City. Filed Nov. 16, 1899.

206. Fastening Device for Heads of Electric Glow-Lamps. Johann Kremenezky, Vienna, Austria-Hungary. Filed March 10, 1888.

499. Electric Are Lamp. William Vogel, New York City. Filed Aug. 5, 1899.

#### ELECTRICAL MACHINERY AND APPARATUS.

645,688. Electric-Motor Control, Wells R. Hamlen, Johnstown, Pa., assignor to the Johnson Company of Pennsylvania. Filed April 19, 1899.
645,689. Appratus for Control of Electric Motors. Wells R. Hamlen, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Original application filed April 19, 1899. Divided and this application filed Sept. 12, 1899.

April 19, 1899. Divided and this application filed Sept. 12, 1899.
645,103. Electric-Circuit Controller. Benjamin N. Jones, Orange, N. J. Filed July 21, 1899.
645,116. Electric-Motor Control. Frank A. Merrick, Johnstown, Pa, assignor to the Johnson Company of Pennsylvania. Filed April 19, 1899.
645,117. Electric-Motor Control. Frank A. Merrick, Johnstown, Pa, assignor to the Lorain Steel Company, of Pennsylvania. Original application filed April 19, 1899. Divided and this application filed Aug. 11, 1899.
645,125. Alternating-Current Meter. William H. Pratt, Lynn, Mass., assignor to the General Electric Company of New York Filed June 7, 1899.
645,126. Electric Meter. Lyman C. Reed, New Orleans, La, Filed July 10, 1899.
645,127-645,128-645,129. System of Electric Metering, Lyman C. Reed, New Orleans, La, Filed July 10, 1899, Nov. 3, 1899 and Nov. 3, 1899.
645,130. Alternating-Current Motor. William G. Rhodes, Salford, England. Filed Nov. 22, 1899.
TELEPHONES AND TELEPHONE APPARATUS.

# TELEPHONES AND TELEPHONE APPARATUS.

645,402. Telephone-Exchange System and Apparatus. John Z. Miller, Eric, Pa., assignor of one-half to Peter H. Adams, same place. Filed Dec. 12, 1899.

### MISCELLANEOUS.

55. Apparatus for Producing Caustic Soda. Henry S. Anderson, Springfield, Mass. Filed Feb. 23, 1899.
567. Hanger for Electric Ceiling Fans. William H. Ayers, West Hoboken, and Emil Groth, Union Hill, N. J.

Avers, West Hoboken, and Emil Groth, Union Hill, N. J. Filed July 20, 1839.
695. Method of Electric Welding. Robert P. Brown and Franklin E. Morse, New York City. Filed March 16,

Franklin E. Morse, New York City. Fried march 10, 1898.
187. Wire-Conduit Tubing. Cortlandt D. Richmondt, Milwaukee, Wis. Filed Nov. 20, 1899.
198. Process of Producing Incandescent Materials Suitable for Electric Lighting. Georg Alefeld. Darmstadt, Germany, assignor to the Pharmazeutisches Institu Ludwig Wilhelm Gans, Frankfort-on-the-Main, Germany. Filed Feb 21, 1899.
247. Method of Starting Asynchronous and Synchronous Monophasic Electric Motors. Eugenio Cantono, Rome, Italy. Filed July 7, 1899.
251. Battery-Electrode. Frank K. Irving, Newark, N. J., assignor of one-half to Andrew G. Vogt, Filed May 2, 1899.

Method of Electrically Treating Materials. Edward

645,284. Method of Electrically Treating Materials. Edward G. Acheson, Buffalo, N. Y. Filed May 23, 1899.
645,377. Electrical Street Indicator. George W. Stevenson, Cramer's Hill, N. J., assignor to Theodore Leas, Camden N. J. Filed Dec. 7, 1898. Renewed Dec. 20, 1899.
645,398. Igniter for Explosive Engines. Lewis Jones, Jr., Philadelphia, Pa. Filed June 22, 1899.
645'405. Electrical Music-Box. Josef Natterer, Jersey City, N. J., assignor to the Symphonion Manufacturing Company, New York City. Filed July 29, 1899.

# REISSUE. 11,812, Rail-Bond.

812. Rail-Bond. C. J. Mayer. Philadelphia, Pa., assignor to the Protected Rail Bond Company, same place. Filed Feb. 12, 1900. Original No. 642,554, dated Jan. 30, 1900.



### GENERAL NEWS.

## What is Going On in the Electrical World.

#### LIGHTING.

Bentonville, Ark.—The citizens of this place contemplate the erection of an electric light plant.

Birmingham, Ala.—The board of revenue of Jefferson county will receive bids for an electric light plant to be established in the court house and jail.

Blakely, Ga.-Investigations are being made relative to constructing an electric light plant at this place.
Address W. L. McDowell.

Bunker Hill, Ind.—The people here are interested in the electric light question.

Caro, Mich.—There is a movement on foot to organize an independent electric lighting plant at this place. Several prominent business men are interested in the acheme

Cherry Creek, N. Y.—If a franchise can be secured, E B Crissey and L. C. Langworthy will install an electric light plant here.

Chicago Junction, O.—The citizens of this place will vote at the spring election on issuing \$15,000 worth of bonds to build an electric light plant.

Clinton, Wis.—The village board has called a special election to vote upon the question of erecting an electric light plant.

Corydon, Is.—An election will be held March 26 to vote on the question of issuing \$12,000 in bonds for an electric light plant.

Fargo, N. D -The Hughes Electric Company of this place has sold its plant to the Edison people. It is announced that \$100,000 will be expended in improvements. General Hughes & Sons still retain large interests in the company.

Frankfort. Ind.—This city has decided to install an electric light plant to cost \$60,000.

Galena, Ill.—The city council has appointed a committee to select a site upon which to erect a new electric light plant.

Sault Ste. Marie, Mich —W. M. Everett and others have submitted a proposed franchise for a new electric light plant, which will be in operation 12 months from the time of granting the franchise.

Grand Forks, N. D.—The Grand Forks Gas & Electric Company will soon erect a new electric light plant in this city. Superintendent Roycroft can be ad-

Little Falls, N. Y.—The citizens of this place are arranging to have a steam electric lighting plant of their own, the estimated cost of which will be \$46,680.

Martinsburg, W. Va.—Sprague Bishop, representing the Bishop Electric Light & Power Company, has made application to the city council for the granting of a franchise throughout the city for the purpose of erecting and conducting an electric light plant.

Middleville, N. Y.—It is rumored that there will be electric lights here in the near future.

New Martinsville, W. Va.—F. C. Lowther is interested in the electric light project now in question here.

Opelika, Ala.—The Alabama Electric Light & Power ompany, lately incorporated, will erect a new electric light plant.

Rawlins, Wyo.—The purchasers of the Rawlins electric light plant have ordered an entire new outfit of machinery, which will be put in soon.

Richmond, Va.—The light committee of the Carnival Association is soliciting bids for the construction of an electric light plant.

Richmond, Ind.—The citizens will decide by vote at the coming election whether the city council shall pro-ceed to put in a municipal electric light plant or not.

Stillwater, Minn.—An electric light plant is to be erected by the city council.

Terrell, Tex.—The plans and specifications have been prepared for a 600 horse-power electrical heating and steam plant to operate the electric lights, heating and laundries of the North Texas Iúsane Asylum.

Toronto, O.—The new Toronto Electric Light & Power Company is about to build an electric light plant just east of the Toronto depot. A. G. White is construction engineer for the company.

Union City, Mich.—The electric lighting system here is inadequate, and the citizens will shortly vote on the question of spending \$8,000 for improvements.

#### STREET RAILWAYS

Bristol, Va.-The Bristol Belt Line has decided to build several extensions in the town and also to the suburbs. G. L. Carter is interested in the project.

Calhoun, Ky.-The people here are greatly elated with the prospects of the electric railway to Owensboro. Work will be begun soon and the road will be in operation by September.

Canal Dover, O—Local capitalists are engineering a plan which they believe will result in a continuous trolley line across this State from Lake Erie to the Ohio River, which, it is argued, can be operated to a better advantage when the electric lines which now stretch over a good part of the State are connected and the untracked portions bridged over.

Chattanooga, Tenn.—The Chattanooga Electric Railway Company has decided to enlarge its power house; also to build the proposed extensions to Sherman Heights and Rossville. J. H. Warner is president of

the company.

Coshocton, O.—The right of way for the Zanesville, Adamsville & Coshocton Electric Railway is about secured. The line will do a passenger and freight business and will cost about \$250,000. J. B. Wilson of Zanesville, O., is president.

Dalton, Mass.—Local parties are interested in forming a company to build an electric railroad between this town and Hinsdale. Among those interested are A. E. Chamberlin, D. H. Tower, W. L. Tower and others.

Detroit, Mich.—The right of way for the Detroit & cledo Electric Railway has all been secured and work will begin early this spring.

Ellenville, N. Y.—Charles N. Morse is interested in

the proposed trolley road between here and Lackawack.

Foxcroft, Me.—There are rumors of an electric road from here to Sebec Lake, in the near future, to be obtained from the Greely mill.

Franklin, Tenn.—Negotiations are on foot for the construction of an electric car line from here to Nashville via the Nashville turnpike.

Irvington, Ind.—The town board is negotiating with the Indianapolis & Greenfield Electric Railway Com-pany with a view toward granting the company a fran-chise to operate its lines through the streets of Irving-

Kenosha, Wis.-P. F. Havnes and G. L. Clauson Chicago have asked the council for a san electric railway through this city.

Kenova, W. Va.—The Ohio Valley Electric Railway Company will receive bids until March 31 for the con-Company will receive bids until March 31 for the construction of about 8 miles of electric railway from the Big Sandy near Kenova to Central City near Huntington, W. Va. Address G. Brown, chief engineer of the Ohio Valley Electric Railway Company.

Marshall, Mich.—F. N. Rowley of Kalamazoo and C. H. Frisbie of Jackson have made application for a franchise for an electric street railway through this citv.

Marinette, Wis .- The Marinette Street Railway Company will build an electric railroad line from here to the town of Peshtigo, a distance of savan miles the town of Peshtigo, a distance of seven miles, some time during the coming year. It will cost about \$40,000.

Meriden, Conn.—Electricity as the motive power on the Meriden and Waterbury branch of the Consolidated road is now looked upon as a certainty.

Natchez, Miss.—J. C. Shaffer and H. W. Bogers of Chicago with F. S. Mordaunt of Vicksburg, Miss., have become interested in the plan to build a street railroad in Natchez

Odessa. Dal.-There is talk of building a trolley line between here and Middletown.

Pittsburg, Pa.—The project to construct a traction line from this city to Cleveland now looks as if it may go through. If the management gets the right of way through Sewickley it will then only be a question of

Richmond, Ind.—Henry B. Pruden of Dayton, O., of the Richmond & Eston Electric Railway Company has filed a petition with the county commissioners for a franchise over the National road from this city to Dublin, twenty miles west.

Rockford, Ill.—The movement looking to the construction of an electric line from this city to Beloit and farther north is being carried on, and the supervisors will be called on for the right of way along the highway from Rockford to Rockton and then to Beloit. W.W. Austin is one of the promoters.

Valparaiso, Ind.—G. Mitchener of this place has secured a franchise for an electric line between here and Michigan City.

Wareham, Mass.—A franchise has been granted to the Middleboro, Wareham & Buzzards Bay Street Rail-way Company for the right to construct a trolley railway through this town.

Xenia, O -J. P. Martin is interested in the construction of an electric road between this city and Spring-

# POWER AND TRANSMISSION PLANTS,

American Falls, Idaho.—It has been decided by the Oregon Short Line to construct an electric power plant at this place. Work will be commenced this spring. Electrician Geo. L. Thayer is to have charge.

Appleton, Wis.—O'Keefe & Orbison, hydraulic engineers and mill architects, have prepared plans for the development of about \$40,000 horse power of electrical energy at the Sault Ste. Marie. The enterprise is under the direction of the Edison Sault E'ectric Company, who will use the power for electric lighting. and for lease to various manufacturing plants at "the Soo."

Redding, Cal. - An immense electrical power plant is to Redding, Cal.—An immense electrical power plant is to be established on the the McCloud River in this county. Preliminary work is to commence immediately. The purpose of the plant is to furnish power to the numerous mining and smelting works of the county and to transmit power and light to this city. The plant will be constructed with a capacity of 4,000 horse power. A canal will be built for 10,000 horse power capacity, so that the plant may be increased upon demand.

#### MANUFACTURING.

Gloversville, N. Y.-The Bachner-Moses Company Gloversville, N. Y.—The Bachner-Moses Company has awarded contracts to the Troy Belting & Supply Company for a new steam and electric plant for the new factory which the company is to erect in addition to the present establishment on Marshall avenue. The engine will be of 40 hp. and the boller 60 hp., and the electric plant will have a capacity of 250 lights.

Syracuse, N. Y.—The Pass & Seymour Company, manufacturers of electrical supplies, is doing double the amount of business it did a year ago. Although the capacity of the plant in its new building has been doubled, the orders have increased along with the company's ability to take care of them.

Troy, N. Y.—The E. G. Bernard Co. of this city has received a contract to equip the steamer Chateaugay of the Champlain Transportation Company with a searchlight and electric lighting system. The company will also install a searchlight and electrical apparatus on the patrol boat of the Buffalo Fire Department.

#### COMPANY MATTERS.

Atlanta, Ga.—The Georgia Electric Light Company, of which H. M. Atkinson is president, has purchased the building at 24 East Alabama street, and will improve it preparatory to installing \$100,000 worth of new machinery. An electric storage tattery will be installed and three rotary transformers, etc.

Chicago, Ill.—The Mutual Electric Company of this city has been dissolved.

Jersey City, N. J.—It is understood that the National Power & Manufacturing Company, formed recently with a capital of \$2,000,000, is connected with the street and electric light companies with which James C. Young and Bernard Shanley, of this city, are connected. The National Power & Manufacturing Company will operate all the different electric plants which are now operated to supply power to the North Hudare now operated to supply power to the North Hud-son Street Bailway Company, and the electric plants of this city and Newark.

this city and Newark.

Joliet, Ill.—The American Railway Company, which owns the electric street car lines in this city, has bought the Chicago Rapid Transit franchise running from Lockport to Chicago and the franchise of the Chicago & Des Plaines Valley Railroad Company, which makes three franchises in all. A double track will be built from Joliet to Lemont, work on which will be commenced early this spring.

menced early this spring.

Le Roy, N. Y —The Le Roy Gas & Electric Company, which has a five years' contract for lighting the village, is negotiating for the purchase of the Haskin's mill property, a fine water privilege on the Oatka in the southwestern part of the village. If the deal is consummated it is understood that the present plant will be removed to that point and operated by hydraulic DIESSUFO.

Mt. Pleasant, Utah.—The Mt. Pleasant Electric L'ght Mt. Pleasant, Utah.—The Mt. Pleasant Electric L gnt Company has ordered a new generator for the plant in this city, which is to be in place by April 15. The generator is of 1,016 sixteen candle light capacity, and will require 80 horse-power to operate it. It is of the alternating style, and will be accompanied by three transformers, thus giving the company the ability to transmit current to almost any distance. It is the intention of the company to extend the system of wires both north and south, and thus cover almost the entire city.

Pompton Lakes, N. J.—An explosion recently occurred in the H. Julius Smith Electric Works apparently without any warning. A large portion of the works were wrecked, and the loss on stock and machinery is estimated will reach \$50,000.

Woodbury, Pa.—It is given out on good authority that the stock of both the Woodbury Electric Light & Power Company, and the Consumers' Gas Company, which hold sole franchises for lighting this city, have been absorbed by a syndicate, which has been negotiating for control of the plants the past few months.

# AUTOMOBILES.

New York.—Three scientific Frenchmen, who arrived on the L'Aquitaine from Havre a short time ago, have set out to accomplish the task of crossing the icy wastes of Alaska into the heart of the Klondike by an automobile. The gold-hunters brought with them an automobile of five horse power, which is run by gasoline, and a motor tricycle of three horse power, run by petroleum. They intend to substitute runners for the rear wheels and place a rim with saw teeth on the front wheel. The power applied to the front wheel will enable the teeth to maintain a purchase on the ice, while the runners slide swiftly along, imparting momentum to the automobile sleigh. In the wake of the automobile will be dragged a sledge, on which are to be borne the camping outfit of the travelers, fifty gallons of gasoline, duplicates of the automobile's parts and a tandem bicycle, to be used for exercise or warming up. On the return trip from Dawson in the fall, the automobile will be transformed into another type. ing up. On the return trip from Dawson in the fall, the automobile will be transformed into another type of conveyance by placing the driving machinery with n a cance, substituting paddles for wheels and sail | y gasoline power to St. Michael's.

Poughkeepsie, N. Y.—Colonel John Jacob Astor has ordered an electric vehicle of the carryall size, which he will introduce in passenger service between Rhinecliff station, on the Hudson River Railroad, and Rhinecliff station. beck village. where his summer home, Ferncliff, issituated. The distance is two miles over a splendid p'ece of roadway. The vehicle has been ordered from a New York company in which Colonel Astor is interested.



# THE TELEPHONE WORLD.

# The Plans of the Telephone, Telegraph & Cable Company of America.

President William J. Latta, of the Telephone, Telegraph & Cable Company of America, has issued a statement to the stockholders relative to the assessment of \$2.50 per share on the company's stock, which is the first official announcement as to the officers and plans of the American Bell Telephone Company's rival.

The directors of the company are Harrison E. Gawtry, Charles W. Morse, William H. Gelshenen, John Jacob Astor, Henry R. Wilson, Frank Tilford, George Crocker, Daniel O'Day, Martin Maloney, Oakes Ames, Z. S. Holbrook, Charles E. Adams, Joseph B. McCall, Hugh J. McGowan, J. Henry Cochran, James E. Hays, William J. Latta and Francis M. Jeneks

After alluding to the recent acquisition of the Erie Telegraph & Telephone Company, President Latta says the company now controls the operation of over 115,000 telephones. A plan has been outlined, he states, by which future assessments will be made in such manner as to impose no hardship, and he expresses the belief that it will not be necessary to call in the balance of the unpaid capital. The stock has been listed on the Philadelphia Exchange.

The competition in the telephone service, which is spreading throughout the country in opposition to the Bell Company will appear in Savannah, Ga., when the Georgia Telephone & Telegraph Company inaugurates its system not later than April 1. The company has operated quietly up to this time and expects to start business under favorable circumstances. The officers are: William A. Bisbee, president; Henry Ban, vice-president; J. Randolph Anderson, secretary; Leopold Adler, treasurer, and R. H. Polk, general superintendent. The directors are: W. A. Bisbee, capitalist; Henry Blun, president Germania Bank; J. Randolph Anderson, lawyer; Leopold Adler, merchant: J. H. Estill, president "Morning News"; W. W. Mackall, president Georgia Construction Company: Jacob Paulsen, president Propeller Towboat Company, and H. P. Smart capitalist. The company's authorized capital is \$200,000. The new company has about 900 subscribers, and the management claims that at least half this number will be connected when its operations begin. Practically all the outside installation is completed, and the work being actively pushed ahead now is the adjustment of the switchboard.

A daily paper is responsible for the statement that the general agent of the Western Electric Company, Col. George T Pratt sailed by the steamer Wassland for London. The object of his visit is to Americanize the English telephone system by the introduction of American methods and American machinery. George Elliott, of the American Bell Company, said recently that "London is really fifteen years be hind the times in its telephone arrangements, and this situation is due to the refusal of the English authorities to grant the highway privileges inseparable from the establishment of a first-class system. Mr. Pratt is going over to install our American plan of operating." The telephone systems in London are almost wholly under the control of the Government, and with that city's enormous population, there are, it is said, only about 10,000 'phones, while in Philadelphia alone, with less than one-third of the population, there are nearly 13,000 in daily use.

The annual meeting of the East Tennessee Telephone Company stockholders was held at Bowling Green, Ky., recently. In the report of Mr. O. F. Noel, president and general manager, it was shown that the company had opened new exchanges during the year 1899 at Athens and Winchester, Tenn., also at Winchester, Ky. Much toll line extension was noted, the most prominent of which was the line from Chattanooga to Tracy City, Tenn., this line being the outlet for East Tennessee for Middle Tennessee and the world. Another important feature of the year's work was the construction of the ninety miles of line between Morristown and Bristol, Tenn., with its lateral to Rogerszille. An election was held, and the following were chosen as directors for the ensuing year: O. F. Noel, J. E. Caldwell, Wm. Litterer, of Nash ville, A. G. Sharp, of Atlanta, and Fred F. Wiehl, of Chattanooga.

The Hudson River Telephone Company has filed a protest with the State Board of Tax Commissioners against the valuation placed upon its franchise in the city of Gloversville, N. Y. The company states that the enforcement of the tax would reduce receipts and result in the abandonment of the line.

Forty-six subscribers have been secured for the telephone exchange in Cambridge, N. Y., and the line will be built as son as spring opens. A quantity of poles have already been bought. The Troy Company will extend its line to Cambridge, making a direct connection with the south.

#### More Trouble for the Bell.

The board of aldermen of Springfield, Mass., voted on the 14th inst. to grant a franchise to the Hampden Automatic Telephone Company.

The action of the aldermen is the first successful attempt to invade the Bell field in Western Massachusetts. The promoters of the new company are confident of securing franchises throughout the county.

### Bell Company's Taxes.

The valuations of the special franchise of the Bell Telephone Company in Buffalo and Rochester were considered by the New York State Board of Tax Commissioners on the 13th inst. The franchise in Buffalo has been valued at \$647,000, and that in Rochester at \$250,000. The company maintains that the former should be reduced to \$306,262 and the latter to \$52,400.

A dispatch from Austin, Texas, to the N. Y. "Commercial," states that the Bell telephone people, who operate in Texas under the name of the Southwestern Telegraph & Telephone Company, are going to have a hard time downing the competition springing up rapidly in the larger cities. An independent company is already in operation in Waco and another will soon be ready for operation in Houston. A franchise has been granted by San Antonio, a city of 60,000. to H. M. Aubrey and associates for the establishment of an independent exchange. Mr. Aubrey has applied to Austin for a similar franchise, and it will be granted. It is understood that Mr. Aubrey represents Ohio capitalists, and that they purpose also to establish independent systems in Fort Worth, Dallas and Galveston, and to connect all those cities with long-distance lines. This competition, it is thought, will cause a general reduction in rates. The new companies charge \$3 per month for a business instrument and \$2 for one in a residence.

The meeting of stockholders of the West Virginia Western Telephone Company concluded its sessions recently with the submitting and acceptance of the report of the general manager of the work performed during the year of the company's existence. The following directors were elected: R. H. Ritherford, C. F. Haddox, J. E. Carle, J. P. Sharp, H. C. Henderson, J. F. Dowd, J. H. Grogg, A. H. Cutright and J. H. Lininger. The new board of directors met after the regular meeting and organized by electing the following officers: President, H. C. Henderson; vice-president, C. F. Haddox; secretary, J. H. Lininger; treasurer, R. H. Rutherford; office manager, A. C. Davis.

The Chicago Telephone Company has declared a cash dividend of 3 per cent, for the first quarter of this year, payable April 5 and a stock dividend of \$1,000,000. Stockholders will be privileged to subscribe for \$500,000 additional stock at par. The stock is now in the neighborhood of 225. Next October there will be a second issue of \$500,000 of new stock at par. The outstanding capital is \$5,000,000, and the distribution of the stock dividend will be in the ratio of one share of new stock for each five shares of old. It is expected that the capital will have to be increased in the future about \$1,000,000 per year to keep pace with the development of the business.

The people of Jefferson City, Mo., see cheaper telephones in sight. The city council has passed an ordinance granting the Capital Telephone Company a franchise to creet and maintain a telephone exchange in that city. This company is not allowed to charge more than \$2 per month for business houses, and \$1 per month for residences, churches, schools, etc. The company is a local organization, composed of Superintendent of Insurance Ed. T. Orear, Assistant Attorney General Sam B. Jeffries, Judge A.M. Hough, Ed. R. Hogg, Dr. J. P. Porth, Houck McHenry and others. It will go to work at once securing subscribers at the reduced rate and expects to have 500 telephones in operation by August 1.

Representatives of independent telephone companies in three States met in Terre-Haute, Ind., on the 6th inst., and effected a permanent organization in opposition to the Bell Telephone Company. The officers elected are Charles R. Duffin, of Terre-Haute, president; J. L. Horney, of Clinton, Ind., vice-president: Henry A. Colt. of Terre-Haute, secretary, and J. B. Connelly, of Rockville, Ind., treasurer. The new company is to be known as the Interstate Telephone Association, and it will start with the independent lines now in operation in Indiana, Illinois and Kentucky.

The reduction in the long distance telephone service rates inaugurated by the New England Telephone & Telegraph Company ranges from 8 to 10 per cent, according to the character of the service. For subscribers living in Boston the reduction is \$12 for a cabinet set, \$18 for a desk stand and \$6 for a wall set, and for subscribers outside the Boston exchange limits the reduction amounts to \$6 per cabinet sets. \$9 for desk stands and \$3 for wall sets.

#### A Long Distance Telephone Line in Africa.

A telephone wire has recently been extended up the Congo from Boma, the capital of the Cree State, to the mouth of the Kwa River, a distance of 450 mlles. Boma is fifty miles from the mouth of the river and Kwamouth, as the station is called, is about one hundred miles above Stanley Pool, whence forty odd steamers, now in service on the upper Congo, start up the river on their various routes, which cover a considerable part of the 7.500 miles of navigable waterways.

At present, owing to the feebleness of the electric current, it is impossible to talk over the wire the whole distance between Boma and Kwamouth. The voices are heard between the two points but the words are not to be distinguished. It is necessary therefore to relay the telephonic messace at Tumba, about two-thirds of the way from Boma. This delays the conversation but very little, and in ten minutes it is found that considerable interchange of remarks may be made between the capital and the up-river station. Every word is distinctly audible with this single break in direct communication.

It is proposed, however, to strengthen the electric current and improve the apparatus, and it is expected that long distance telephoning will soon be as easy a matter on the Congo as it is becoming in the civilized parts of the world. Only two years ago it was impossible to communicate between Boma and Kwamouth in less than twenty days; but in twenty minutes now the Governor at Boma may learn the state of affairs at the up-river station and send his instructions to men in charge of it.

Assemblyman Sullivan has introduced into the Legislature at Albany, N.Y., a bill regulating the rates to be charged for telephone service in various cities. The price in cities of one million inhabitants and over not to exceed \$85 per annum; in cities of 500,000 or less than 1,000,000 not to exceed \$75 per annum; in less than 500,000 not to exceed \$48; in less than 100,000 not to exceed \$36; in cities and places of 8,000 and less than 20,000 not to exceed \$37. He also proposes a charge of ten cents for public pay stations. A court of inquiry consisting of the Comptroller, Attorney General, State Engineer and Surveyor are to have charge of carrying these reforms into effect.

Representatives of 30 West Virginia independent telephone companies met the officers of the National and Unite I States Telephone Companies of Ohio in Parkersburg, W. Va., and made plans for a working arrangement between the independent telephone companies of Illinois, Indiana, Ohio and West Virginia. It was agreed to open the main long distance telephone exchange of the combination in Ohio at Marietta, and that of West Virginia in Parkersburg.

Seventy-five representatives of independent telephone companies of Pennsylvania will meet April 10 at the Lochiel Hotel, Harrisburg, to form the Traffic Association of Independent Telephone Companies, the object being the furtherance of a scheme to establish a long-distance system in the State of Pennsylvania.

The Knickerbocker Telephone Company of this city has leased offices for twenty years in the Astor Building, at Elm and Broome streets, with 13,000 square feet of space, and a switchboard for 5,000 telephones will, it is understood, be placed there.

The question of a telephone line from Raymond to Fremont, N.H., is being discussed, and if the citizens of Fremont will furnish the required guarantee a line will be built at an early date by the New England Telephone Company.

The Central Union Telephone Company and the Pemberville Telephone Companies of Pemberville, O., have consolidated.

#### TELEPHONE INCORPORATIONS.

The Higgins, Lipscomb & Kiowa Telephone Company of Higgins, Texas. Capital stock, \$20,000. Incorporators: A. Winsett, H. J. Holm and W. F. Peugh.

The Ashville Telephone Company, Raleigh, N. C. Capital stock, \$80,000. Incorporators: Charity Rusk Craig, Harlan P. Proctor, W. S. Proctor, E. R. Craig and Lycurgus J. Rusk.

The Union Telephone Company, Rockland, N. Y. Capital stock, \$5,000. Incorporators: F. E. Burkett, H. L. Robbins, L. M. Burkett and A. S. Littlefield.

The Havana Telephone Company, incorporated in Trenton, N. J., to operate telephone and telegraph lines in Cuba and the West Indies. Capital stock, \$500,000 Incorporators: William J. Patterson, Edmund G. Vaughan, Edgar Park and Frank C. Prest.

The Madison and Onondaga Telephone & Telegraph Company—to operate in villages of Onondaga and Madison counties of New York State. Capital stock, \$30,000. Incorporators: Frank E. Dawley and Ellis Woodworth.



# SECURITIES. ECTRICAL

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electricity from a variety of sources The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

# STOCKS.

PASSE	NG	ER F	AILW	AYS.			PASSENGER RAILWAYS.						
		Capital	Stock.	Bate and Date of		ľ			Capital	Stock.	Bate and Date of		
FAXE.	Par	Authorz'd	Issued.	Last Div.	Bld.	Asked.	, NAME.	Par	Authorz'd/	Issued.	Last Div.	Bid.	Anked
Albany, N Y Mar 19. United Traction	100	2,000,000	\$1,750,000	1½ % Q., Nov. '98.	123	124	Hartford ConnMar 19: Hartford Street Ry. Co		\$4,000,000 1,000,000		3 % 8., Oct., '98.	150	=
Troy City Bailway.)							Holyoke Mass.—Mar 19. Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June, '98.	2073	212
Allentown Pa.—Mar 19: Allentown & Lebigh Val. Trac Co.		4,000,000	1,500,000	*****		15	Hoboken, N. JMar 19 North Hudson Oo. (N. J.) Ry. Co	26	1,250,000	1 000 000	8 %, 1892.	150	_
Bridgeport, Conn—Mar 19: Bridgeport Traction Co		2,000,000		1 % Aug., '98	105		Indianapolis, Ind-Mar 19. **Citizens' Passenger Ry					24	28
Baltimore 'MdMar 19			' '		161/4		Lancaster, Pa.—Mar 19 Pennsylvania Traction Co	1	10,000,000				_
a United Rail ways & Elec. Cocom  Boston, Mass.—Mar 19	. 50	24,000,000	10,000,000		10/4	10, 1	Lancaster & Cel. Electric By West End Street Railway		• • • • • • • • • • • • • • • • • • • •	87,500			Ξ
New England Street By	100 100 50	5,000,000 4,000,000 2,000,000 10,000,000 6,400,000 10,000,000	4,000,000 2,000,000 9,085,000 6,400,000	1 % Q., Jan.15, '97 6 % S., A. & O. 3% % S., Oct., '98. 4 % S., Jan. 2, '99. 2% % Aug. 98,	15 85	16 87 93 114 104	Louisville, Ky.—Mar 19; Louisville Rycom Louisville Rypfc Minneapolis, Minn.—Mar 19	100 100	4,000,000 2,500,000	8,500,000 2,500,000	1½ %., April '98, 2½ % S., Oct. 1, '98	€8¾ 110	69 111
Brooklyn N. Y Mar 19: Brooklyn City Ry	. 100	20,000,000	1,928,400 20,000,000 200,000		131 665, 107 267	237 6 134 109 239	Twin City Rapid Transitcom Twin City Rapid Transit	. 50	8,000,000 4,000,000	1,712,200 4,000,000	154 %, Oct., '98. 8 % S., M. & N.	186	304 101
eBrooklyn Heignis Rainfoad	100	2,000,000 2,000,000 4,750,000	1,884,200 4,750,000	2 % % Nov., '98.	345		Memphis Tenn.—Mar 19: Memphis Street Railway Co				134 % S., J. & J.	25	101
Nassau Electric Railroadpfd /Atlantic Avenue Railroadpfd gBrooklyn, B. & W. E. Railroad.	. 50	4,500,000 6,000,000	4,500,000 6,000,000 2,000,000	1 % July 26, '97	15	÷0	New Haven, Conn.—Mar 19. Fair Haven & Westville RR New Haven Street Railway Co	25	2,000,000 1,250,000	2,000,000 1,000,000	8 % S., Sept. '98. 2½ % A., July '96.	89	41
Buffalo N. Y.—Mar 19: Buffalo & Niagara Falls Ricc. Ry Buffalo Rallway Oo		1,250,000		1 % Q. Dec., '98.	74 100	75 103	New Haven & Centerville	. 100		600,000	••••••	15	46
Columbus O.—Mar 19 Columbus Street Railroad	. 100	8,000,000 1,500,000		1 % Q., Feb., '99.	26 82	26 % 88	Canal & Claiborne RR. Co	100 100 100	1,200,000	***************************************	1 % 8., July, '98.	1485 25 101	102
Charleston, S. C Mar 19 Oharleston City Ry. Co	50 25	100,000		8 % 8.		::	aCrescent City RR. guar bNew Or. City & Lake RR. guar Orleans Railroad. St. Charles Street Railway.	100	2,000,000 500,000	2.(A(A).(A)(	3 % S., Jan., '99. 4 % S., Jan., '99. 1½ %., June, '94. 1½ %. Oct., '98.	201/4	52
Chicago, Ill.—Mar 19 Chicago City Ry. Co. unicago & South Side R. T. RR. Lake Street Elevated RR. Metropolitan West Side Elev. Ry. Met. West Side El., pfd. North Chicago Street RR. ANorth Chicago City RR. South Chicago City Railway. West Chicago St. RR. Co. yChicago West Div. Ry. guai tChicago Passenger Ry guai	100 100 100 100 100 100	0 10,823,80 10,000,00 0 15,000,00 15,000,00 10,000,00 0 500,00 0 20,000,00 1,250,00	0 10,823,800 0 10,000,000 0 15,600,000 0 2,500,000 0 6,600,000 1,603,200 18,189,000 0 624,900	8 % Q., Jan., 99.	10 27 717 222	276 101/4 24 78 225  85 1.01/4	Twenty-third St. R. D. Co. Sugar	r. 100 100 100 100 100 100 100 100 100 100	1,500,000 1,000,000 750,000 800,000 2,000,000	1,000,000 1,000,000 748,000 800,000 2,000,000 600,000	2½, % Q. 12% Q., Oct., '98. 1½% Q., Nov., 98. 1½% Q., Jan, '99. 1½% Q., Jan, '99. 2½, % Q. 2½, % Q. 1½% Q. 1½% Q.	890 395 195 203	400 410 105 2:0 410
Cincinnati, Ohio.—Mar 19: Cincinnati Inc. Plane Bycom Cincinnati Inc. Plane Rypid Cincinnati, Newport & Cov. St. By Oincinnati Street By. Co	100	150,00	al 150.000	% % Feb '99.	81	89	Second Avenue RR. Third Avenue RR. m42d St. Manhatv'le & St. Nich. A' *Union (Huckisherry) Ry. Newapk N. J.—Mar 19	. 100	2,500,000	1,862,000 10,000,000 2,500,000	0 2 % Q., Jan,, '99. 0 \$1.75 p. sh. Feb, 99	200 9 3/ 10 190	201 95 60 <b>200</b>
Mt. Adams & Eden Park Inc. Ry Cleveland, Ohio.—Mar 19: Agron, Bed. & Clev. Elec. By Cleveland City Ry	100	1,000,00	1,000,000 7,600,000	2½ % Feb., '98, 1½ % Q., Jan., '98, 1½ % Q., Jan., '98, 1½ % Jan., '98, 3-5 % Jan., '99,	48 99 ×	50	Consolidated Traction Co. of N. J North Jersey Street Railway Co. United Electric Co. of New Jersey Pittsburg, Pa.—Mar 19:	y 100		6,000,000		60 25 24	61 26 25
Detroit, Mich.—Mar 19: Detroit Citisens' Street Ry Ft. Wayne & Belle Isle Ry Rapid Railway Co Detroit Electric Railway	100	2,000,00	1,250,000 1,200,000 250,000	9% % Q., Oct., '98.	1003 175 90	91	Allegheny raction Cocom OOonsolidated Traction Copfd pCentral Traction Co qOitizens Traction Co rDuquesne Traction Co sPittsburg Traction Co.	50 1. 50 50 50	0 15,000,000 0 15,000,000 0 1,500,000 0 8,000,000	15,000,000 15,000,000 1900,000 18,000,000	12 %, Jan., '95. 0 3 %, Nov. '98. 11/2 % Nov. 7, '98.	55 277/ 65 69 × 10	66
Wyandotte & Detroit River Ry  Dayton O.—Mar 19: Otty Bailway Oo	100	250,00 0 1,500,00	200,000 0 1,470,600 600,000		140 170 114	110 145 115	Federal St. & Picasant Valley Ry. Pgh., Allegheny & Man. Trac. Co P'ttsourg & Birmingham Trac. Ry Pittsburg & West End Ry. United Traction Cocom United Traction Coprei	· 24	U 17,000,000	1,400,000 [2,994,889 8,000,000 1,500,000 17,000 000		26 <sup>1</sup> , 41 12 49	27 42 18 50

\*Unlisted. † Ex div.
a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co of Baltin ore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds.
b Leased to Boston Elevated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR
g Owned by Atlantic Ave RR and leased to Nassau system.
h 350 per share on outstanding capital pa'd as rental by lessee—West Ohicago St. RR. Co.;
c Controls by lease Chicago West Division Railway, Chicago Passenger Railway,
West Chicago Street Railroad Tunnel Company.
j 55 % per annum paid on outstanding capital as rental by lessee—North Chicago St
Railroad Company; 5625,100 of stock owned by West Chicago Street Railroad Compan
h Majority of stock owned by Chicago Street Railway Company; 5 % on \$1,0
000 stock guaranted by West Chicago Street Railway Company; 5 % on \$1,0
000 stock guaranted by West Chicago Street Railway Company; 5 % on \$1,0
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000 stock guaranted by West Chicago Street Railway Company; 5 % on \$1,0

\*Unlisted. † Full paid. | Outstanding. | Ex-div. |
a Leased to New Orleans Traction Company at 6 % on stock. |
b Leased to New Orleans Traction Company at 8 % on stock. |
b Leased to Central Crosstown Rallroad at 8 % on stock and interest on bonds. |
d Operating the former Met. Trac. system, that corporation having become extinct. |
e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry. |
f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Rallway g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %. |
h Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %. |
h Leased to Metropolitan Street Ry. for 99 years from Jani. 1, 1895, at \$215,000 per annum. |
i Leased to Metropolitan Street Rallway for 18 % on stock |
j Leased to Metropolitan Street Rallway for 18 % on capital stock. |
m Controlled by Third Avenue Rallroad by purchase. |
n Dividends of 1% % yearly guaranteed by Consolidated Traction Company. |
o Controls by lease the Alleg'ny, Cent., Otizens' Duquesne, Fort Pitt & Pitt'h Traction. |
p Leased to Consolidated Traction Company for 8 % per annum on par value of stock. |
e Leased to Consolidated Traction Company for 8 % on capital stock. |
e Leased to Consolidated Traction Company for 7 % on capital stock. |
e Leased to Consolidated Traction Company for 7 % on capital stock. |
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e Leased to Consolidated Traction Company for 8 % per annum capital stock. |

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NAME.	Par	Capital Authors'd		Bate and Date of Last Div.	EM.	Asked.	NAME.	Par	Capital Authors'd		Bate and Date of Last Div.	Bid.	Ashed
New Bedford Mass-Mar 19		1	1			1	Boston, MassMar 19.		1				
Union Street Railway Co Northampton, Mass-Mar 19	100	\$850,000	\$850,000	2 %, Feb. 98,	160	165	American Bell Telephone Co	100 100	50,000,000	28,650,000	1 % Q., Jan '99.	317	317%
Northampton Street Rv		800,000	225,000	4 % A., June '98.	170	178	New Rngland Telephone Co New YorkMar 19:	"	10,894,600	10,804,600	\$1.50 p. sh. Feb '99	. 155	140
Omaha, Neb Mar 19. Cmaha Street Ry	100	5,000,000	5,000,000	8 % A. and N.	55	65	American Telegraph & Cable Co *Central & South Am. Teleg. Co		14,000,000			93 107	98 109
Paterson, N. JMar 19	İ	ł		,			*Commercial Cable Co	100	10,000,000	10,000,000	1½ × Q.	165 42	110
Paterson Ry. Co	100	1,250,000	1,250,000	********	54		Erie Telegraph & Telephone Co *Gold & Stock Telg. Coguar. 6 %.	100	1. 15.000.000	4,800,000	1 % Q., Feb., '99.	112	118
Providence, R. I.—Mar 19 United Traction & Electric Co	100	8,000.000	8,000,000	¾ %, Oct. '98	109	112	*International Ocean Tel Co.guar 6% Mexican Telephone Co	100	2,000,000		1 × × Q. 1 × × Q.	116	118
Philadelphia.—Mar 19 Fairmount Park Trans. Co\$50 pd.	50	2 000 000	1 770 000	2 %, Dec. '97.	28	24	*New York & New Jersey Tel. Co *Pacific & Atlantic Telegguar. 4 % *Postal Telegraph Cable Co		2.000.000	8,728,000	21, % Q., Jan., '99. 2 % 8.	170 50	175 - <b>75</b>
Hestonville, Man. & Fairmount Hest'nvi'e, Man. & Fairm't6 % pfd.	50	1,966,100	11,966,100	2%, %, July 15, '98. 3 % S—July, '98. 3 % Feb. 1, '98.	47 75	48 76	*Sout'n & Atlantic Telg. Oo.guar.5 % †Commercial Union Telegraph Co	100 25 25	950,000	559,525 500,000	1 % Q. 2% % S. 8 % S., Jan., '99.	95 115	100
aFairmount Pk. & Had. Pass. Ry. Union Traction Co \$12% pd	50 50	80,000,000	[ 29,980,450]	******	75 351/4	76 31/24	Western Union Telegraph Co Div. guar. by Postal Teleg. Co.	••		97,870,000	1½ %, Q, Jan. '99.		£3¾
dCitizens' Passenger Ry	50	500,000	8,297,920 †192,500	88 share Q.	345	::,	MiscellaneousMar 19:	i					1
Frankford & Southwark Pas. R	50	1,000,000		\$14 sha'e A—Apr.98 A. & O.	48	451 90%	American Dist. Teleg. (Phila.) Bell Teleph. Co. (of Canada.)	25 100	8,960,000	8,561,000	1 % Q. 2 % B.	21 188	84
dSecond & Third Street Ry  People's Traction Co	25 50 50	1,060,000	<b>+771,076</b>	89 share A, Mar. 98 8 %, A., April, '98.	800		Chesapeake & Potomac Telep. Co Chicago Telephone Co	100	••		****	65 200	70 210
gGermantown Passenger Ry	50 50	1,500,000	572,800	\$5,25 share—1898.	144 151	145 152	Central Dist Prig & Telg.Co.(Pgh.). Empire & Bay States Telegraph Co. Hudson River Telephone Co	100	750,000 2,000,000	750,000 2,000,000	• • • •	148 75 117	150 76
hPeople's Passenger Rycom. hPeople's Passenger Rypfd.	25	1,500,000 750,000	1740,000 1277,402	******			*Northwestern Telegraph Coguar Providence (R. I.) Teleph. Co		2,500,000	2,500,000	2% X Q	137	120 95
(Philadelphia Traction Co	50		1400.000	\$2 p. sh., Oct. 98. 6 % A—Mar., '98.	95	961/4	Southern New Eng. Teleph. Co	100			•		1
Continental Pass. Ryguar Empire Passenger Ry. Co	50 50	600,000	1580,000	86 share—July, '98. \$7.50 share July '98.		157 203	ELECTRIO LIGHT	N.	D ELE	ECTR	IOAL MFQ	.0	<u> 08,</u>
Philadelphia City Pass. Ry Philadelphia & Gray's Fy. RR Ridge Avenue Passenger Ry	50 50 50	1,000,000	298.650	\$7.50 share July '98 \$3.50 share July '98 \$12 share, July '98.	100		Boston, Mass.—Mar 19: Fort Wayne Electric trust receipts		••		•	115	125
Philadelphia & Darby Ry.guar. 17th & 19th Ste. Pass. Ry. guar	50 50	• • • • • • • • • • • • • • • • • • • •	1200,000	32 share July, '98. 1½ % S., July, '98.		::	Ft. Wayne Elec Co. T. Sec. Series A. (General Electric Co. [old] com.	25 100	• • • • • • • • • • • • • • • • • • •		2 % Q., Aug., 1898.	35	40
Thirteenth a 15th Sts. Pass. Ry.		1,000,000	1835,000	811 sh. A., July, '98 89.50 shre, July '98	209	240	General Electric Co. [new] " TH. Elec. Co. T. Secur., Series D.	100	18,276,000	18,276,000	1% % Q., May '99.	125½ 2>	125 %
West Philadelphia Pass. Rv	50		750,000	\$10 share, July '98	25)		Westinghouse Elec. & Mig.Co.com. Westinghouse El. & Mig. Co. pid.	50 50	4,000,000		1¾ % Q., Jan., '99.	48 61	48¼ 62
Rochester, N. Y.—Mar 19 Rochester Railway Co	100	5,000,000	5,000,000		17%	20	Westinghouse El. & Mig. Co. assent.  New York.—Mar 19:	50	11,000,000	8,195,126	•••••	42	-
Reading, PaMar 19			, ,				Edison Elec. Ill'g Co., New York *Edison Elec. Ill'g Co., Brooklyn		9,188,000 4,000,000		1½ % Oct., '98.	119	120
heading Traction Co	50	850,000	850,000	Semi-an., <b>Jan. &amp; Jy</b> Jan., '98.	138	26	Edison Ore Milling Co	100		2,000,000	17, 7, 001., 10.	8 82	12 93
Kast Reading Electric Ry St. Louis MoMar 19	50	1,000,000	‡1,000,000	Jan., '98.	70	••	General Electric Oo. [old]com.	100	40,000,000 18,276,000	30,460,000 18,276,000	2 % Q., Aug., 1898. 1% % Q., May '99.		126
Fourth Street & Arsenal Ry	50 50			2 % Dec., 1888.		::	Interior Conduit & Insulation Co Kings Co. El. L. & P. Co	100 100	1,000,000	1,000,000 2,500,000		41 110	126
Lindell Ry National Railway Uo	100		2,400,000 2,479,000	1¼ % Jan., '99. 1½ % Jan. '99.	::	::	Pittsburg, Pa.—Mar 19 Allegheny County Light Co				- 4 -		
Cass Avenue & Fair Grounds Oitizens' RR	••	2,500,000	2,500,000 1,500,000	4 % Oct. 198.	••	::	East End Electric Light Co	100 50		500,000 800,000		168	172
St. Louis RR	100 50	2,000,000 2,400,000	2,000,000	2% %, Jan., '99.	••	::	Philadelphia, Pa.—Mar 19 Edison Electric Light Co	100	2 000 000		*****	144	144%
People's RR. Co	50 50	500,000	500,000	50C., Dec., 55.	25 71	80 80	*Electric Storage Battery Cocom. *Electric Storage Battery Copfd.	100	8,500,000		•••••	98 98	93½ 97
Bouthern Electric Ry 6 % pref. 18. Louis & Suburban Ry	100	2,500,000	9 500 000	3 %, Jan., '99. 3 % A., July, '95.	68	10	Northern Elec. Light & Power Co Southern Elec. Light & Power Co	10 10	550,000 187,500	550,000 187,500	••••	18 80	18%
Jnion Depot RR	100	1,000,000	\$,000,000	6 76 A., July, 501			MiscellaneousMar 19:	_				'	} 
California St. Cable RR	100 100	1,000,000	875,000	50c. monthly. \$2.50 share, '96.	117 60	119	Bridgeport (Conn.) Elec. Lt. Co Missouri-Edison (St. Louis)com. Eddy Electric Mfg. Co	25 25	500,000		****	47 25 10	28 14
Market Street Ryresidio & Ferries RR	100 100	18,750,000 1,000,000	18,750,000	Q., 60c. per share.	61)4	68¾ 16	Hartford (Conn.) Elec. Light Co Hartford (Conn.) Lt. & Power Co	100 25		•••••	••••	156	160 10
Scranton Pa -Mar 19		# mm mm	0 500 000		29	80	New Haven (Conn.) Elec. Lt. Cc Narragansett (Prov., R.I.) Elec. Co.	100 50	100,000		2 % Q., Oct., '98.	195 98	100
Beranton Railway Co	100 100	500,000	2,500,000 500,000 1,050,000		16%		Rhode Island Elec. Protec. Co Royal Elec. Co. (Montreal)		1,000,000		1% Q 1	1184 193	191
n Scranton & Pittston Traction Co Springical III.—Mar 19		1,000,000	1,000,000	•••••	"	"	Toronto (Canada) Elec. Light Co Thomson-Houston Welding Co	100		1,085,000	154 % Q 8 % 8, Dec. 1, 96.	••	13434
Springfield Consolidated Ry	100	<b>750,000</b>	750,000	***************************************		••	Woonsocket (R. I.) Electric Co †On Aug. 17 last by a majority vot	e of	the stock!	holders th	ne capital stock we		
Springfield O.—Mar 19 Springfield Street By	100	1,000,000	1,000,000			11	to \$20,827,200, of which \$18,276,000 is c Recently acquired the Edison Illi	umi					div.
Springfield, MassMar 19		1 000 000	1 100 500	1 8 / A	207	212	pany, the Municipal Electric Light		INDUS	STRIE	· Q		
pringfield Street By  Foronto Canada.—Mar 19	100	1,200,000	1,166,700	5 75 A.	~.	***				7777			_
Toronto Street Ry Montreal Street Railway Co	100	6,000,000 4,000,000			101½ 301¼	10114 304%	Boston Mass.—Mar 19; Delaware Gas Light Cocom.	50 50	500,000	500,000	J. & J.	72%	
Washington, D. CMar 19:		•			''		Delaware Gas Light Copref. American Electric Heating Oo Street Ry. & Illu'g Propertiespfd	50	10,000,000	200,000	J. & J.  \$2 p. sh. Jan. 26, '99	98	=
Eelt Ry, Co		112,000,000	12,000,000	65c. per sh, Oct. 97.	¥5	98	United Electric Securities Copfd.	100	4,500,000	1,000,000	\$8.50 p.sh. Nov '98.	••	100
Nolumbia Ry. Co	50 50 50	707,000	652,000		85 15	40 16	New York.—Mar 19: Consolidated Electric Storage Co				••••	я	12
Beorgetown & Tenallytown Ry Metropolitan RR. Co	50			2 <b>⅓ % Q</b> .	••		Safety Oar Heating & Lighting Co	100 100	• • • • • • •	5,500,000	•••••	150	155
Worcester, MassMar 19 Worcester Traction Cocom.	100	8,000,000	8.000.000		25	28	Worthington Pump Copfd Philadelphia PaMar 19	100			7 % A	109	110
Worcester Traction Co6 % pfd. Worcester & Suburban Street Ry	100 100		2,000,000 542,500	8 % S., Feb., '98. 4 % %, 1897.	105	106 85	Electro Pneumatic Trans. Co United Gas Improvement Coscrip.		1,500,000			ı	1
Wilkesbarre, Pa.—Mar 19:				10/ 1 100			Welsbach Commercial Cocom. Welsbach Commercial Copfd.	100 100	10,030,000 8,500,000 500,000	• • • • • • • • • • • • • • • • • • • •	2 X Q	61 /s 52	162 7% 55
* Unlisted. † Paid in. ‡ Full					25	29	Welsbach Light Co	5	525,100 500,000			40 3%	41
a Leased to Hestonville, Man & b Consolidation Electric, Pec	c Fai	rmount P	ачвеnger F	ty, for 6 % on stock			LICESDAIR A		,			•,,	-~
charges and all indebtedness of Traction Company.	cons	tituent ar	id leased	companies assume	d by	Union	Standard Underground Cable Co	100 100	200,000 1,000,000	290,000 1,000,000		175	180
c Practically all shares owned d Lease to Frankford & Southy	vark	Parsenge	etion Comp r Ry. <b>a</b> ssu	oany. med by Electrie Tr	actio	n Co.	MiscellaneousMar 19:	100		1 000 000		10,	141
e Leased to Electric Traction C f Controlled by Frankford & S	outh	wark Pas					*Barney & Smith Oar Copfd. Billings & Spencer Co	100 100 25		1,000,000 2,500,000	5 ×	164 82	104
g Leased to People's Passenger h Majority of stock owned by Leased to Union Traction Cor	Peor	le's Tract	per snare. ion Comp	any.			Oonsol. Oar Heating Co	100 100		1,250,000	1½% Feb. '98	58	60 109
j Lease transferred to Union T	raeti	on Compa	rental of	\$10,000 per annum	In 1	1866-7-8	Pratt & Whitney Cocom.	100			 	4	8 52
declared as a dividend semi-annu	per ally.	annum 1	nereaster,	рлувые веші-вині	ally,	rental,	Stillwell-Bierce Copfd.	-:-	•••••	••••	2 % Sept 1,'98.	50	50 65
h Dividend of 10 % guaranteed Dividend of 6 % guaranteed l	by l by R	eading Tr	action Co	npany.		_	Shults Belting Co	100	500,000	••••••	*****	₩ 03	90 1 <b>06</b>
Leased and operated by the S					ractic	on Co.	'Unitated.	ı	J	1	l		ļ

# BONDS.

PASSEN	SER R	AILWA	Y.				PASSENGER RAILWAY.						
	Amor	int.		Interest				Amon	ant.		Leterest		
NAME.	Authorized.	Issued.	Due	pariods.	Bid.	Asked.	NAME.	Authorized.	Issued.	Due	periods.	Bid.	Anke
Albany N. Y.  *Date of Quotation—Mar 19, 1900  The Albany Ry. CoCons. mig. 5s.  The Albany Ry. CoGen. mtg. 5s.	\$500,000 750,000	427,500 875,000			*117%		New Orleans La.  Date of Quotation—Mar 19, 1900.  Canal & Claiborne RR cons mig. 6s.  Crescent City RR	5 000 000	50,000 8,000,000	1899 1948	M. & N. M. & N. J. & J. J. & D.	1051/4	112
Watervielt Turnpike & RE. 1st mg. os Watervielt Turnpike & RE. 2d mg. 6s. Froy City Railway Co	850,000 150,000	850,000 150,000	1919	M. & N. M. & N.	*125 *128 *116½	127½ 127	N. Orleans & Carrollton RR. 2d mtg. g. 5s. Orleans Rallroad Co Cons. mtg. 6s. 184. Charles St. RR. Co 1st. mtg. 6s. 18422,500 in escrow to retire New Or-	850,000 800,000 800,000	2,599,500 850,000 800,000	1948 1907 1912	J. & J. F. & A. J. & J. J. & D.	112	118
Principal and interest guar. by Albany By.Co. Baltimore Md.							leans City RR. Co.'s 1st mtg. bonds. 1\$90,000 outstanding. New York						0
Date of Quotation- Mar 19, 1900	38.000,000	18,000,000	1040	MAR	102	1021/4	Atlantic Ave. (Brooklyn)lmp. g. 5s.	1,500,000 759,000	1,500,000	1984	J. & J. M. & S.	95	110
Inited Electric Ry. Colst mtg g. 4s.  Baltimore City Pass. Ry. lst mtg. g. 5s. Baltimore Traction Colst mtg. 5s. Baltimore Trac. Co. Exten. & Imp. g. 6s. Bal. Trac. Co. No. Balto div. Ist mtg. g. 5s. Bal. Trac. Co. Coll. Trust, Ist mtg. g. 5s. Bal. Trac. Co. Coll. Trust, Ist mtg. g. 5s. Baltimore Traction Co. Convertible 5s. Central Pass. Ry. Colst mtg. 6s Central Pass. Ry. Colst mtg. g. 5s. City & Suburban Rylst mtg. g. 5s. Lake Roland Elev.,lst mtg. 5s.	14,000,000 2,000,000 1,500,000 1,250,000	2,000,000 1,500,000 1,250,000 1,750,000  117,000 580,000 8,000,000	1949 1911 1929 1901 1942 1906 1912 1932 1922	J. & D. M. & N. M. & N. M. & S. J. & D. J. & J. N. & M. J. & J. M. & N.	74 <sup>8</sup> / <sub>4</sub> 1187/ <sub>8</sub> 119 104 / <sub>4</sub> 121 101 102 / <sub>9</sub> 119 116 117	75 120  121 ½  121 117	Atlantic Av. (Brooklyn). 1stgen. mtg. 5s. + Atlantic Av. (Brooklyn). Cons. mtg. 5s. 1Bro'dway & 7th Ave. 1stcons. mtg. 7s. Broadway & 7th Ave. 1st mtg. 5s. Broadway & 7th Ave. 2d mtg. 5s. Broadway & 7th Ave. 2d mtg. 5s. Broadway Surface. 1st mtg. 5s. Broadway Surface. 2d mtg. 5s. Brooklyn City RR. Co. 1st cons. mtg. 5s. Brooklyn City & Newtown. 1st mtg. 5s. Brooklyn, Bath & W. E. RR. Gen. mtg. 5s. Brooklyn, Heights RR. 1st. mtg. 5s. Brooklyn, Q's Co. & Sub'n. 1st mtg 5s. Brooklyn, Q's Co. & Sub'n. 1st mtg 5s. Brooklyn, Q's Co. & Sub'n. 1st cons. 5s.	8,000,000 1,2500,000 500,000 1,125,000 1,000,000 6,000,000 2,000,000 1,000,000 250,000 3,500,000	1,966,000 7,650,000 1,500,000 1,125,000 1,000,000 2,000,000 248,000 250,000 8,500,000 2,750,000	1981 1948 1904 1914 1924 1905 1941 1989 1938 1941 1941	A. & O. J. & D. J. & D. J. & J. J. & J. J. & J. J. & J. J. & J. M. & J.	107½ 115 128 104 108 115 105 116 115 101 104 112 107	110 116 125 105 110 117 106 117 116
** All of the bonds of the above ompanies, marked †, have been asumed by the United Railways & Electic Company.							Brooklyn Rapid Transit	7,000.000 700,000 1,200,000 250,000	5,181,000 700,000 1,200,000 250,000 800,000	1945 1900 1902 1922 1908	J. & D. M. & N. J. & J.	109% 101% 107 125 101	108 109
BOSTON, MSSS.  Date of Quotation—Mar 19, 1100  Lynn & Boston RBlst mig. g. bs. West End Street RyDeben. g. 5s. West End Street RyDeben. g. 4½s. #\$1,674,000 in escrow to retire outstanding bonds of absorbed companies.	5,879,000 8,000,000 2,000,000	8,702,000 8,000,000 2,000,000	1902	J. & D. M. & N. M. & S.	114 104% 112	115 106 	Dry Dock, E. Bd'y & Bat'y R. gen.mtg.g. 5s Dry Dock, E. Bd'y & Bat'y RR. scrip 5 %. Eighth Av. RR. CoCert. indebt. 6 %. 42d St., Man. & St. Nich. AvIst mtg. 6s. 42d St., Man. & St. N. Av2d mtg. inc. 6s. Lex. Ave. & Pav. Ferry RR. Ist mtg. g. 5s. Metropolitan St Ry Oog. m. cl. tr. g. 5s Second Avenue RvGen.com mtg. 75	1,000,000 100,000 000 000 ,200,000 1,500,000 5,000,000 12,500,000	1,100,000 1,000,000 1,200,000 1,500,000 5,000,000 1°,500,000 1,600,000	1914 1910 1915 1998 1997 1909	F. & A. M. & S. J. & J. M. & S. F. & A. M. & N.	117 102 108 116 % 89 124 120 120	120 105 117 125
Charleston S. C.  Bate of Quotation— Mar. 19, 1100.							Second Avenue RyDeb. 58.	300,000 1,500,000	800,000 1,500,000 850,000	1922		118% 116 110%	109 117 112
Enterprise Street RBlst mtg. 5s. Charleston City Rylst mtg. 6s. †Controlled by Charleston St. By .Co.	500,000 850,000	47,000	1906	J. & J. J. & J.	106		South Ferry RR. Co	150,000 2,000,000	150,000 2,000,000	1987 1909 1906 1942	J. & J. J. & J. J. & J. F. & A	106 118	128 108 116
Chicago III.  Date of Quotation—Mar 19, 1900							ttWestchester Electric RR1st mtg. 5s. t81,085,000 in escrow to retire gen. mtg. bonds.	500,000	500,000	1948	J. & J.	110	114
Ohicago City Ry 1st mig. 4½s. Chicago Passenger Ry 1st mig. 6s. Chicago & So. Side R. T 1st mig. 6s. Chicago & So. Side R. T 1st mig. 6s. Chicago & So. Side R. T 4½s. Chicago & So. Side R. T 4½s. Lake Street Elevated RR. 1st mig. g. 5s. Getrop, W. Side Elev. Ry 1st mig. g. 5s. Gorth Chicago St. RR 1st mig. 5s. Gorth Chicago St. RR 1st mig. 6s. Gorth Chicago City Ry 1st mig. 6s. Gorth Chicago City Ry 1st mig. 6s. Gorth Chicago St. RR 1st mig. 6s. Gorth Chicago St. RR 1st mig. 6s. Gorth Chicago St. RR 1st mig. 6s. Gorth Chicago St. RR 1st mig. 6s. Gorth Chicago St. RR 1st mig. 6s. Gorth Chicago St. RR 1st mig. 6s.	6,000,000 400,000 1,000,000 1,500,000 1,500,000 4,040,000 7,574,000 15,000,000 8,171,000 500,000 2,500,000 4,100,000 2,500,000	600,000 7,500,000 4,040,000 8,781,200 15,000,000 8,171,000 500,000 2,500,000 8,969,000	1908 1929 1929 1907 1982 1928 1942 1906 1911 1900 1927 1928	F. & A. J. & D. A. & O. J. & J. J. & J. F. & A. J. & J. J. & J. J. & J. M. & N.	1013/4 1081/6 108 108	102 102 109 96%	184,850,000 in escrow to retire maturing obligations.  (\$552,000 in escrow to retire 1st and 2d mig. bonds.  \$In treasury, \$80,000.  11 Guar. by Union By. Co.  TOPONTO Canada.  Date of Quotation—Mar 19, 1900.  Montreal St. By	2,500,000 4,550,000	800,000 2,200,000		M. & S. W & S.		
Vest Chicago St. RR Con. mtg. g. 5s. W. Ohicago St. RR. Tunnel 1st mtg. 5s. †Redeemable at option on 60 ds. notice. Frunded debt assumed by Ohicago W. ty. Ry. Co., controlling interest of thich is owned by W. Chicago St. RR. o., lessee. †Subject to call after Oct. 1, 1899, at 110 and interest. [Assumed by W. Chi. RR. Co., lessee. †Int. guar. by W. Chi. RR. Co., lessee. †Int. guar. by W. Chi. RR. Co. Cincinnati, O.	12,500,000 1,500,000	6,000,000 1,500,000	1986		1065/8	107	Philadelphia.  Date of Quotation.—Mar 19, 1600  Continental Pass. By	800,000 100,000 150,000 250,000 500,000 1,125,000 5,698,210 200,000 1,800,000	810,000 200,000 100,000 	1898 1901 1905 1911 1912 1948 1910	J. & J. J. & J. M. & S. J. & .		
Date of Quotation—Mar 19, 1500.  lin. New. & Cov.St. By. last Con.msg. g. 58  Mt. Adams & Eden P'k Inlst mig. 68.  Mt. Adams & Eden P'k Inlst mig. 68.  Mt. Adams & Eden P'k Inc. Cons.mig. 58.  O. Cov. & Clin. St. Rylst mig. 68.  T. Assumed by the Cincin. St. Ry. Co.  13220,000 reserved to retire lst mig. bds.	46,000 100,000	2,500,000 46,000 100,000 581,000 250,000 400,000	1900 1905 1906 1912	A. & O. A. & O.	118 % 108 % 1 4 108 3 % 12 1 % 182 3 %	114% 104  122% 187	Thirteenth & 15th St. Ry	250,000 750,000	100,000 500,000 29,724,876 246,000 750,000	1911 1945 1905 1906 1926	A. & O. A. & O. A. & O. M. & N.	***************************************	
Cleveland, O.  Date of Quotation—Mar 19, 1500  Brooklyn Street RR. Co1st mtg. 6s. In. New't & Cov. St. Ry. Cons. mtg. 5s. Cleveland City Cable Ry1st. mtg. g. 5s. Cleveland Electric Ry. Co. 1st mtg. g. 5s. Cleveland RR1st mtg. g. 5s. East Cleveland RR1st mtg. g. 6s. tt. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	800,000 3,000,000 2,000,000 8,500,000 1,500,000 1,000,000 600,000	1,249,000	1922 1909 1918 1918 1910 1922	M. & S. J. & J. J. & J. M. & S. M. & N. M. & S. M. & N.	1061/ <sub>3</sub> 1181/ <sub>3</sub> 1051/ <sub>4</sub> 106	107 114½ 106 107	Pittsburg. Pa.  Date of Quotation—Mar 19 1500  Birmingham, Knox & Allentown6s. Central Traction Co	500,000 875,000 1,250,000 1,500,000 50,000 1,250,000 750,000 250,000	750,000 250,000	1927 1980 1918 1942 1928 1924	M. & S. J. & J. A. & O. J. & J. J. & J. J. & J. M. & N. J. & J.	110	113
orain (O.) Street Rylst mig. 6s. St. Ry. Oo., Grand Rapidslst mtg. 5s. †\$1,900,000 in escrow to retire buils of bsorbed companies, marked a. †Interest guar. by Cons. St. Ry. Co. DetPoit, Mich.	200,000	200,000	1915	J. & J. J. & D.	••••	::::	Pittsburg Traction Co	750,000 1,500,000 500,000 1,500,000 2,500,000 500,000	750,000 1,500,000 500,000 1,400,000 2,000,000 500,000	1927 1929 1922 1980 1934	A. & O. M. & N. J. & J. A. & O. J. & D. V & S.	108%	108
Date of Quotation—Mar 19 1100 Detroit Citizens' St. Rylst mtg. 5s. t. Wayne & Belle Isle Rylst mtg. 5s. the Detroit Rylst mtg. 5s. †21,150,000 in escrow to retire bonds of tet. City Ry. and Grand River St. Ry.	7,000,000 400,000 1,800,000	8,885,000 877,000 1,800,000	1902	A. & O.	105	102 1/4 106 3/4	United Trac. & Elec. Colst mtg. g. 5a	50,000 9,000,000	50,000 8,260,000	1910 1988	J. & D. M. & S.	116	118
New Haven Conn.  Date of Quotation Mar 19 1:00  When Haven St. Ry1st mtg. g. 5s.  Whaven (Edgewood Div.) Ist. mtg. 5s.  Winchester Avenue RR—Ist mtg. g. 5s.  Winhester Avenue RR Deben. g. 5s.	600,000 250,000 100,000 100,000	600,000 250,000 500,000 24,600	1914 1912	J&D M&N	111 111 109		St. Louis.  Date of Quotation—Mar 19, 1500  Baden & St. Louis RR	5000,000 1,600,000 2,000,000 1 000 000	250,000 1,600,000 1,500,000 000 000	1912 1907	J&J	100 102 109 117	102 1023 1094 118

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#### PASSENGER RAILWAY. Amount. Interest periods. MAME. Authorized | Issued. Bid. Asked. St. Louis. Date or Quetation- Mar 19, 1100 1905 M. & N. 1911 F. & A. 1916 M. & S. 1910 A. & O. 1902 J. & D. 1902 J. & D. 1904 J. & J. 1905 M. & N. 1906 M. & N. 1921 F. & A. | 400,000 | 1905 | M. & N. | | 1,500,000 | 1911 | F. & A. | | 700,000 | 1916 | M. & S. | | 800,000 | 1910 | A. & O. | | 15000 | 1902 | J. & D. | | 75,000 | 1904 | J. & J. | | 75,000 | 1905 | M. & N. | | 75,000 | 1905 | M. & N. | | 1,400,000 | 1905 | M. & N. | | 500,000 | 1909 | M. & N. | | 500,000 | 1918 | J. & J. | | 1,091,000 | 1918 | J. & J. | 108 108 105 100 400,000 400,000 105 103 106 102 400,000 1,500,000 400,000 400,000 75,000 1,000,000 75,000 2,000,000 2,000,000 800,000 500,000 1,091,000 101 100 % 104 100 99 1/6 8,500,000 †Controlled by St. Louis BB. Co. Controlled by Union Depot BB. Co. Controlled by Lindell BR. Co. \$200,000 in escrow to retire 1st & 2d itg. 2\$500,000 in escrow. ||\$200,000 in escrow to retire lst mtg. San Francisco Cal. San Francisco Cal. Date of Quotation—Mar, 1900. California St. Cable RB....lst mtg. g. 5s. t Ferrles & Cliff House Ry....lst mtg. gs. Geary St., Park & Ocean RB..lst. mtg. 5s. Market St. Cable By. Co...lst mtg. g. 6s. Metropolitan Ry. Co....lst mtg. gs. t Metropolitan Ry. Co....lst mtg. 6s. t Park & Ocean RB....lst mtg. 6s. t Park & Ocean RB....lst mtg. 6s. t Park & Ocean RB....lst mtg. 6s. utter St. Ry. Co....lst mtg. g. 5s. t Controlled by Market St. Ry. Co. Washington D. C. 900,000 | 1915 | J. & J. 650,000 | 1914 | M. & S. 671,000 | 1921 | A. & O. 8,000,000 | 1918 | J. & J. 114 1263 2,000,000 | 1918 | A & O. | 850,000 | 1912 | J & J. | 250,000 | 1914 | J & J. | 700,000 | 1912 | M. & S. | 900,000 | 1918 | M. & N. 126 % 105 % 115 107 125 Washington D. C. 450,000 | 1920 | J. & J. 500,000 | 1914 | A. & O. 200,000 | 1901 | J. & D. 500,000 | 1901 | J. & J. 500,000 182 500,000 Miscellaneous. 2,000,000 5,000,000 4,000,000 8,000,000 15,000,000 4,000,000 4,000,000 6,000,000 5500,000 550,000 1,250,000 8,000,000 110 105 118 1111/2 1113% 116% 20 80 119 110½ 108 85 119% 110% 4,298,000 1937 1,000,000 1900 1053 108 106 1.000.000 †\$1,000,000 in escrow to retire 1st and d mig. bds. 1\$800,000 in treasury. Bonds guar. by Buffalo Ry. Co. 1\$760,000 in escrow to retire bonds of .C. St. B.R. Co. 1\$87,000 in treasury. 1\$2960,000 res'ved to redeem prior liens. 1\$120,000 in escrow. With intrest ELECTRIC LIGHT AND ELECTRICAL MFG. COS Roston, Mass. \* Jate of Quotation- Mar 19 1100 106 167 116 800.000 800.000 J. & J. 2,026,000 10,000,000 Quar. 1922 8,750,000 1911 J. & J. ..... M. & S. 110 500,000 195,570 ••••• Miscellaneous.-(Mar 19, 1900.) Religion Bl. Hig. Co. (N. York) ist m. 5s., Edison El. Hig. Co. (N. Y.) con. m. g. 5s. Edison Elec. Hig. Co. (Brooklyn)...... Edison Electric Light (Philadelphia)... Kings Co. El. Lt. & Pow. Co. ist mig. 5s. Kings Co. El. Lt. & Po. Co. pur. money 6s. Milwankee El. Ry & Lt. Co. ist con. g. 5s. United Elec. Light & Power Co(N. Y.)... 10**9** 124 12*ኒኒ* 4,812,000 2,188,000 5,000,000 4,812,000 15,000,000 5,000,000 2,000,000 2,500,000 5,176,000 8,000,000 5,000,000 124 2,500,000 5,176,000 6,108,000 1937 A. & O. 1997 A. & O. F. & A. 103 122 TELEPHONE AND TELEGRAPH. Miscellaneous. Date of Quotation - Mar 19 1900. 10 L 1001 1908 F. & A 115 106 J. & D. 1911 ALLIED INDUSTRIES. Miscellaneous. 600,000 6 U.O.O 1942 J. & J. 1904 J. & D. 25 107 106 75,000

# NOTES FOR INVESTORS.

Late quotations for copper are : Electrolytic, 152@16c.; Lake, 162@162c.; casting, 152@.152c.

Local capitalists are said to have bought out the Edison and Westinghouse interests in the Electric Illuminating Company of Cumberland, Md.

The United Traction and Electric Company of Jersey City, N. J., has declared a dividend of 1 per cent., payable April 2. Books closed March 20 and reopen April 3.

Contractor John B. McDonald's life has been insured for \$2,000,000 by August Belmont, the head of the syndicate which will finance the construction of the rapid-transit tunnel in New York.

The Westinghouse Electric and Manufacturing Company has declared a quarterly dividend of 13 per cent. on its preferred stock, payable April 2. Books close March 24 and reopen on April 3.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 17@20; New York Electric Vehicle Transportation, 74@8; New England Transportation, 54@6.

The Amalgamated Copper Mining Company has declared the regular quarterly dividend of 1½ per cent. and an extra dividend of ½ per cent., payable April 30. Books close March 26 and reopen May 1.

Shortly before the close of the Stock Exchange in New York on Monday the failure of A. M. Hunter, of No. 52 Broadway, was announced. The failure, it was said, was due to the squeeze in local traction stocks.

The Appellate Division of the Supreme Court has affirmed two judgments aggregating \$56,100 against the Manhattan Elevated Railway Company for loss of value in favor of a property holder on Sixth avenue, of this city, due to the elevated railway structure.

At a maeing of the board of directors of the Telephone, Telegraph and Cable Company of America in this city on the 14th inst., the following executive committee was appointed: William J. Latta, ex-officio, Martin Maloney, Charles W. Morse, Daniel O'Day, and Charles E. Adams.

United States production of copper (long tons) for February, 1900. aggregated 20,897 tons compared with 21,013 tons for the previous month and 19,889 tons February, 1899. Exports of copper from the United States (long tons) for February, 1900, aggregated 12 749 tons compared with 14,035 the previous month, and 8,391 tons, February, 1899.

According to a report submitted to the Stockholders of the Easton Consolidated Electric Company of Easton, Pa., for the seven months ended December 31, 1899, the net earnings were in excess of \$60,000. This concern is a consolidation of the Eastern Transit Company, the Edison Illuminating Company of Easton, and the Easton, Palmer & Bethlehem Street Railway Company.

The Third Avenue Railroad Company of Naw York has passed into the control of the Metropolitan Street Railway Company. The receivership will be wound up as soon as possible. President Vreeland, of the Metropolitan, made the official announcement yesterday. Monday Third Avenue Stock leaped from 66½ to 85½ and as we go to press (Tucsday afternoon) the stock is quoted at 95½.

The syndicate which is after all the electric railways in and about Worcester, Mass., has taken up its options on four more. The owners of the Worcester Traction Company and others are back of the deal. The plan is to unite all the roads under one management There will be big savings in superintendents' salaries and in other ways. The combined capital of the four just taken is \$500,000.

The report of the Brooklyn Haights Railroad Company of Brooklyn, N. Y., for the quarter ended Dacember 31, 1899, which contains the results of the oparations of all the railroads in the Brooklyn Rapid Transit system, and which exhibits a surplus of \$17,052 for the quarter, shows that the Brooklyn Rapid Transit Company earned just \$93,736 38 profit on the oparations of all of its roads for the first six months of its present fiscal year, covering the period from June 30 to Dacember 31, 1899.

The Chicago Telephone Company has declared a cash dividend of 3 per cent. for the first quarter of this year and a stock dividend of \$1,000,000. Stockholders will be privileged to subscribe for \$5,00,000 additional stock at par. The stock is now in the neighborhood of 225. Next Ostober there will be a second issue of \$500,000 of new stock at par. The outstanding capital is \$5,000,000, and the distribution of the stock dividend will be in the ratio of one share of new stock for each five shares of old.

At a special meeting of the stockholders of the Western Union Telegraph Company on the 14th inst. the proposed issue of \$20,000,000 of 4½ per cent. refunding fifty year bonds was approved by a two-thirds vote. Directors of the company met later and declared the regular quarterly dividend of 1½ per cent. The report for the quarter ended Ottober 1, 1899, shows a surplus of \$8,292,383.16, with net revenues during that period of \$1,579,486.58. On January 1 of this year the company had a surplus of \$8,430,753 61.

In Boston on Monday, Judges Putnam, Aldrich and Brown, of the United States Circuit Court of Appeals for the First District, handed down a decision in the case of the Electric Storage Battery Company against the Hatch Storage Battery Company, affirming the decision of Circuit Judge Colt, wherein the Hatch Battery was held to be an infringement of the Brush patent. This is the most substantial legal victory ever won by the Electric Storage Battery Company and means the continuation of its monopoly in modern storage batteries.

A mortgage for \$1.000,000, given by the Rochester Gas and Electric Company to the Security Trust Company of Richester, N. Y., was filed on the 15th inst, with the County Clerk. It was given to secure \$1.000,000 of 4½ per cent. gold bonds designed to refund \$310,000 of 5 per cent. second mortgage bonds, maturing on March 15, 1902, and to provide for the extension of the company's plant. The bonds are for \$1,000 each, with interest payable March 15 and September 16. The company reserves the right to retire any or all of the bonds on March 15, 1910, or on any other semi-annual interest day.

As we go to press a dispatch from Boston says that "the consolidation of the American Bell Telephone Company with the American Telephone and Telegraph Company of New York is confirmed through the issuance of a call for the annual stockholders' meeting of the Bill Company to be held in Boston March 27. The call announces that the stockholders will be asked to authorize the conveyance of the company's entire real estate, ratifying the assignment to the American Telephone and Telegraph Company of the property of the company other than the company's Long Dis ance stock and distributing the shares of the Long Distance Company in exchange for the stock of the Bell Company."

The uncertainty converted with the method to be presented by the Metapolitan

Company in exchange for the stock of the Bell Company."

The uncertainty connected with the method to be pursued by the Metropolitan Street Railway Company of New York City in providing cash for its proposed improvements and extensions, has had a depressing effect upon the stock in the market. It has been officially announced that \$10,000,000 will be expended upon the property. Should this be provided for by an issue of new stock, the charge upon the property at the present rate of dividends would be \$700,000 per annum. On the other hand the selling of bonds which would not bear interest at less than 5 percent, would make an increased fixed charge of \$500,000. No definite action will be taken immediately and one proposition under consideration is the issue of \$5,000,000 of stock and \$5,000,000 new bonds, which would make \$600,000 additional or the company to pay yearly.



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# LECTRICITY

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# EDITORIAL NOTES.

#### A Mecca for Electrical Workers.

During the next three or four years there is to be an immense amount of

money expended in New York City and vicinity that should materially benefit the electrical industry.

Last Saturday the first spade full of dirt was formally turned up near the City Hall, which marked the beginning of an undertaking involving the expenditure of some \$35,000,-000, a portion of which amount will ultimately find its way into the pockets of electrical manufacturers and electrical workers. Aside from the \$16,000,000 which it is estimated will be put in circulation for labor, and the \$12,000,000, which will go to rolling mills and quarry owners, before the underground road is ready for travel, two or three millions at least will have to be expended for electrical machinery and apparatus. A power station will be built, innumerable motors will be required, especially if, as is now thought probable, the multiple-unit system of propulsion is adopted, while thousands of electric lamps will have to be installed for illuminating the tunnels and the stations. Add to the above, electrical signaling devices, and some fair idea may be had of the immense demand there will be for electrical workers and electrical apparatus.

But the undergound rapid transit system is by no means the only large project in this vicinity that will afford electrical manufacturers and workers an opportunity to turn an honest penny. During the next fifteen months the motive power on the elevated roads of this city will in all probability be changed from steam to electricity, which will involve an expenditure of several million dollars, while only recently it was announced that the Metropolitan Traction Company proposed shortly to expend \$8,000,000 in substituting electricity for the cable on some twenty-five miles of its lines. Of course by no means all of the eight million will find its way into the hands of the electrical fraternity, but it is pretty safe to assert that one-quarter to onefifth of this sum will go for electrical equipment, feeder cables, etc. To these projects should be added that of completing the electrical equipment of some of the Third Avenue Railroad Company's lines, which will undoubtedly be carried out under the new regimé,

added to the fact that in all probability before the present proposed rapid transit tunnel is completed another tunnel to connect with it from Brooklyn will have been started, would certainly lead one to believe that, at least so far as New York City and vicinity is concerned, the outlook for electrical workers and manufacturers is most encouraging. It is not often that undertakings requiring an outlay of eight or ten million dollars for electrical apparatus and machinery are started up almost simultaneously in one locality.

# \*

## The Economy of **Electric Motors** Over Shafting.

In spite of much misplaced conservatism electric motors are fast replacing shafting and belts in paper

mills, printing establishments, machine shops and in the driving of cotton mill machinery. That the direct application of power to the various machines to be operated by means of electric motors has much to recommend it we have several times pointed out in these columns, but, like every innovation, mill and shop owners have been slow to discard the old type of apparatus, each apparently preferring that his neighbor should be the one to take the first step in a seemingly untrodden field. To a certain extent it was a case of "what was good enough for my father is good enough for me" in fact the same stereotyped cry that has probably done more to keep many countries fifty years behind the times than anything else.

Of late, however, many shops and mills have been obliged to do away with belts and shafting in self-defense. Rivals in their line of business started up with new plants embodying the latest type of machinery and apparatus, with the result that conservative old-timers found their business dwindling away through competition. In other words, they were being undersold. An examination into the matter usually revealed the fact that with the old type of plant it required a consumption of about one-third more coal for the same output. This discovery, as may be imagined, had a bad effect on conservatism, with the result that the old plant was speedily renovated and antiquated lines of shafting and belting discarded in favor of electric motors. Referring to this subject "Cassier's Magazine" for April will

say:
"All experience thus far with electric power for shop service has gone towards establishing the fact that electric motor installations are

money savers. The friction of long lines of main shafting and sometimes of subsidiary shafting is avoided, and this, as has become well known, represents a very substantial portion of the total power ordinarily consumed. With its elimination, the power required to operate an establishment has been known to come down to astonishingly low figures, in one recorded instance being only about 26 per cent. of the actual rated motor equipment of the shop, while in another it barely exceeded 15 per cent. of the shop capacity, even though in this the power necessary for an electric crane had been included, and that required for lighting."

As we have pointed out several times no matter how well the shafting in a shop or mill is aligned or how carefully the apparatus is kept oiled there is always a loss through friction of from 45 to 50 per cent. Moreover, when in a shop a large number of separate machines are driven from one line of shafting an enormous amount of power is necessarily wasted owing to the intermittent nature of the work performed by the various tools or machines.

The advantage of electric motors in cases of this kind is clearly shown in the article already referred to, which says:

"In the extensive establishment of the Baldwin Locomotive Works at Philadelphia, with electric motors in service requiring collectively 3,500 horse power, the generator capacity provided is only 1.550 horse power, and of this, too, a 250 hp, unit is kept in reserve, leaving only 1,300 horse power in service. Of the motor equipment 400 horse power is said to be constantly idle or undergoing repairs, so that the final proportion is 1,300 hp. in the generators to 3,100 in the motors, or about 1:2.4 According to one authority, one-third of the rated motor capacity will usually be ample for the generator capacity in large plants; according to another, one-sixth has been found sufficient. These proportions obviously require qualification for different conditions, but they all help to bear out the truth of the original proposition as to the economy of the new order of things."

That it is an economy is rapidly being appreciated, not only in almost every line of industry in this country, but by conservative European manufacturers as well.

\* \* \*

Suggestions as to the Prevention of Electrolysis. The destruction of water pipes by electrolysis continues apace, and from many parts of the

country come cries of anguish mingled with imprecations against the local trolley companies. In some localities the Water Commissioners are endeavoring to force the street railway companies to compensate them for the damage done, at the same time insisting that steps shall be immediately taken to prevent return currents straying into the ground. Wilmington, Del., is one of the localities where at present legal steps are being taken to compel the City Railway Company to pay for the ravages of stray currents on water pipes. In Wilmington it is not only the money represented in damages that the Water Commissioners desire to recover, but it is their wish to obtain a precedent to govern such cases in the future.

Rochester, in this State, is another city that is suffering from the same complaint, but unlike Wilmington, no definite action has as yet been taken nor an electrical survey made. Numerous other places could be named where

the local water-works system is suffering through electrolytic action, in each one of which the invariable query is "How can it be prevented?"

In the last issue of "City Government," Emil Kuichling, formerly chief engineer of the Rochester Water Works, endeavors to answer this question, and among other things says:

"1. Improvement of the railway tracks by providing heavier rails, more effective bonds at the rail joints, and larger return feeders. This plan is receiving the most attention at the present time, and has been pursued to some extent by the Rochester Railway Company. The opinion is, however, generally entertained that this remedy only moderates in some degree the danger to the underground pipes.

"2. Efficient bonding between the rails and track return system and the various underground pipes, cable sheaths, etc., at numerous points within the danger area, so as to make all of these elements direct return conductors. The difficulty with this plan is the probable danger to the pipe joints by the large currents of electricity that may thereby be transmitted through them under different conditions of operating the street cars, and the consequent variability of the limits of the danger area. It may also become a strong temptation to the railway company to neglect further improvement of the track return system, and to depend entirely upon the underground pipes as return conductors. This method may accordingly be left out of consideration unless it is kept under the closest surveillance of an expert.

"3 The provision at the railway power station of auxiliary generators, whose negative poles connected to the underground pipes alone by suitable wires, and which by being operated constantly under a higher potential than the generators connected with the track return system, tend to exhaust the current more rapidly from the pipes than it is taken from the track return system, thus keeping the pipes negative to the rails at all times and places. It is also understood that no direct connections whatever are here to be made between the rails and the pipes, and that the latter shall receive only the smallest practical quantity of spent current by constructing the tracks in the best manner throughout. This plan appears to be both rational and effective, although not yet extensively used. It is, however, subject to the same objections named in the preceding paragraph."

This question of devising means for preventing electrolysis has been discussed over and over again before the various electrical and engineering societies of this country, and sad to relate, although the matter has been given careful thought by probably some of the best minds in the world, no sure or really satisfactory electrolysis preventative has been forthcoming.

The third method referred to by Mr. Kuichling, or rather a modification of it, namely, that of running a large conductor from the grounded side of the dynamo or dynamos in the power station through the danger territory, and connecting it at intervals to such pipes as are positive to the rails, is probably the most satisfactory yet brought out, although even this arrangement leaves much to be desired. When, however, the rails of a single-wire overhead trolley system are electrically welded in place, forming a continuous return, and this is supplemented by the arrangement just described, there is little doubt but what the

danger to water pipes through electrolysis is reduced to a minimum.

\* \* \*

Another Stockjobbing Canard. The following dispatch was published in the Boston "News Bureau" on Friday, March 23, and of course had its origin in

Wall Street—the transposing of the firm name showing the fine work of a schemer:

N. Y.—The Halske-Siemens Electrical Company is to go out of business. This will divide the electrical territory pretty thoroughly between the Westinghouse and the General Electric Companies with enormous profits for each. Quiet buying of General Electric has been noticed in the market the past few days.

A representative of ELECTRICITY with the above clipping was sent to the New York office of Siemens & Halske to obtain a verification of the report and the manager immediately called up President Lloyd, of the Siemens & Halske Company in Chicago, on the telephone. Mr. Lloyd, after the dispatch had been read to him, pronounced it a base fabrication, said that there was not a particle of ground for the report, and that it was published solely for stockjobbing purposes.

Of course the publication of the false statement sent a leading electrical stock up three points and allowed the "rumor mongers" an opportunity to "take a flyer in the market."

# UNDER THE SEARCHLIGHT.

#### Notes and Comments on Various Topics.

Mr. W. J. Johnston, formerly editor of the "Electrical World," writes that he arrived at Colombo, Ceylon, February 15. From there he goes to Calcutta and thence across India to Bombay.

ACCORDING to a statement the development of electrical traction railways in Mexico has been so rapid that second-hand cars from this country, replaced here by better patterns, are eagerly sought for.

The Equitable Life Assurance Society of the United States will have an exhibit at the Paris Exposition which will reflect great credit not only on that company, but upon American ingenuity generally, as the most striking feature of the exhibit will be an American electrical display representing the marvelous growth of American life insurance. For this purpose fac-similes of the Statue of Liberty in New York harbor, the Eiffel Tower, Arc de Triomphe and other objects of interest, both in America and France, will be represented in vari-colored electric lights.

M. MERCADIER, a French inventor, claims to have solved the problem of sending a number of dispatches simultaneously on a single wire. His system, which was explained last week before the Academy of Sciences in Paris, was recently tried successfully between Paris and Pau. Twelve independent currents were sent on the circuit at once, and in each direction, making a total of twenty-four telegrams.

Some encouraging facts in regard to American industries abroad have recently been shown. The British Government has ordered 150 type-writing machines from an American company, the largest order it ever gave to any company, British or American. The English Northeastern Railway Company has been placing orders for locomotives in the United States



and an American company has secured a contract to furnish the Bedford (England) Electrical Light Committee with nearly all of its machinery. American locomotives have been subjected to severe trials in Bavaria, and the Prussian Minister of Railways officially reports that "notwithstanding their faultless construction they cost considerably less than locomotives of similar style of Prussian make."

THE State Department at Washington received a telegram from Richard T. Greener, United States Consul at Vladivostock, the eastern terminus of the Trans-Siberian Railway, that estimates had been prepared for the construction there of an electric trolley tramway 20 miles long, electric lights and waterworks, and that proposals were desired from the United States.

The rebuilding of Timber Dry Dock No. 2 at the Brooklyn Navy Yard has progressed so far that the department of yards and docks have asked for bids for the new steel caisson, which is to be used in place of the old one. Bids will be opened March 31. The new caisson will be of an improved type equipped with electric machinery instead of an engine and boiler, as are used in the other caissons about dry docks owned by the Government. The new caisson will cost between \$40,000 and \$50,000. Although the new entrance to the dock will be of the same size as that of the old one, the caisson which is now in use will be discarded.

F. A. EMBRSON, assistant postmaster, in Cleveland, O., has evolved a novel scheme for providing a pneumatic tube for carrying mail between the post office and the Union depot. Mr. Emerson proposes to use the cable conduit of the Superior street line of the Little Consolidated road in which to place the pneumatic tube. The street railway expects to abandon its cable power and substitute electricity as a motive power next summer, and if it does so the conduit will be useless as far as the railroad is concerned.

ONE of the latest devices is a rocking electric bath tub. The top is covered with a water-proof apron that fits around the neck of the bather, while an electric current is made to pass through the water between two copper electrodes. The whole arrangement is pivoted so that a rocking motion may be imparted to it by the bather if desired.

In a recent issue of "L'Electricien" there appears a table showing the growth of electric street railways in the principal countries of Europe during the past four years. Germany leads the list with a length of 250 miles of electric railways in 1896, which in 1899 had in creased to 2,160 miles. Austria-Hungary comes next with a length of 45 miles in 1896 and 600 miles in 1899. The third place is taken by the United Kingdom, the figures being 67 miles in 1896 and 600 miles in 1899. The next countries in order are Italy, France, Switzerland, Russia, Belgium, etc.

A SALE of condemned stores will be held at the Brooklyn Navy Yard during the first part of May. They will consist of cloth, old iron, instruments and electrical appliances, some of which were in the recent fire at the yard. It is expected that there will be over one hundred bidders, and a classified list will be issued by the Paymaster's Department before the sale, which will be advertised for thirty days, according to the regulations.

From all accounts a severe coal famine is being experienced in Europe. This is especially so in Russia and Germany. In the latter country as many as a dozen electric lighting and power plants have but a very limited supply of fuel on hand, which will necessitate their shutting down in the course of a few weeks unless coal can be obtained from some unknown source.

It is officially stated that the total length of railways in France working on December 31 last was 26,522 English miles. There were in addition 2,338 miles of electric railways.

HARRY LONG, of Greentown, Ind., writes "that he has been granted letters patent on a new invention known as an electric lamp support. Through this device it is claimed that it will be impossible for men to receive a shock while placing carbons in arc lamps."

The Rapid Transit Commission of New York is now giving serious consideration to the question of constructing pipe galleries at the same time its tunnel work is going on. These galleries are for carrying gas, water and sewer pipes and conduits for wires. The conduits carrying the electric wires of private corporations for power and heat and other things, as well as piping generally could, it is thought, be made a very considerable source of revenue.

THE Nernst lamp has now been so perfected that the engineers of the German company are going to subject it to the test of commercial usage, When Prince Albert, of Prussia, went to celebrate the opening of the "Twentieth Century" at the University of Gottingen, his apartments were lighted with Nernst lamps. Now the lamp is being advertised in Gottingen for house and store lighting. The lamps are rented for 12 cents (50 pfennigs) a month and will remain the property of the company. The lamps are to be used on the regular commercial 110-volt circuit and require about 0.3 ampere for 25 cp. The company supplies an alcohol heater and expressly forbids the use of matches.

THE important part that electricity will play in the modern house, says the N. Y. "World," is shown for the first time in the equipment of "Villa Julia," the magnificent residence Isaac S. Rice is building on Riverside Drive, New York. One of the new features of this up-to-date home will be an automobile room, and in addition there will be arrangements for lighting, heating, cooking, washing, ironing, drying clothes, ventilation, electric fans, elevator, sewing machines, bells, fire alarm, telephone, phonographs and kinetoscopes, all by electricity. Mr. Rice is an automobile enthusiast. He has devoted considerable space in his \$1,000,000 house to his carriages, and has arranged to have a connecting wire from the Edison Company, and will charge his own vehicles. While it has been the fashion in Paris for several years to have an auto-room in a dwelling, Mr. Rice's home is probably the first one in this city to contain this feature.

According to an English journal, the amount of money invested in the electrical industries of Great Britain closely approaches \$500,000,000. Of this amount, about \$170,000,000 are invested in telegraphs, electric traction claims \$100,000,000, electrical manufacturing concerns about \$80,000,000, electricity supply by municipalities about \$41,000,000, electrochemical and miscellaneous industries about \$40,000,000, and telephony about \$38,000,000.

In a lecture last week before the Knickerbocker Athletic Club of this city, Mr. Hiram P. Maxim, referring to automobiles, among other things said that the advantages of the electric machine were extreme "sweetness" of movement, elegance and simplicity of operation and control. Their disadvantages were the short mileage permissible, their weight and their cost. He thought, however, that the greatest development would take place in electric automobiles of all others. Gasoline machines are favored for their lightness, speed and 'unlimited distance of travel. The public, however, was not yet "up to" their operation fully, and was inclined to see first their defects, particularly that of shaking when not in transit.

A Massachusetts chemist has just patented a copper coating for protecting the hulls of steel and iron ships against the accumulation of marine growth and galvanic action. The new copper coat is impervious to water and is applied over a special quality of red oxide. The latter is hermetically sealed by the coating and thereby strongly protects the plating of the ship. The new coating is applied after the manner of paint. It is composed of three metals and will, it is claimed, last for seven years with occasional docking and repairing of the ship to which it is applied.

On March 10 Mr. Marconi gave a demonstration of his system of wireless telegraphy before the King of the Belgians. The instruments were placed in rooms about 500 feet apart, and the signals had to traverse thick walls. All the messages, including one written by the King, were most satisfactorily transmitted. An English daily paper states that his Majesty has promised to support the adoption of the system in Belgium generally and in the Belgian army particularly.

The first test of the automobile which is to represent this country in the long distance automobile race for the International Cup in France on June 14 next was made in Cleveland last week over a long stretch of the Cleveland Boulevard. Mr. Alexander Winton, inventor of the machine, was at the lever, and he said that his first test, while made under rather unfavorable conditions, appeared to him satisfactory, and that while he would make no claims of any character for the American challenger, he felt that he was justified in announcing that it had in every way met his expectations.

According to a contemporary the wellknown Italian inventor, Dr. D. Tommassi, has devised an ingenious cartridge for mining and blasting purposes, which is said to be entirely inexplosive, and safe until its contents are electrolyzed by the passage of a current through them. The cartridge is a stout glass tube, containing a platinum wire sealed in at each end, and is filled with a concentrated solution of ammonium chloride. When this perfectly inert substance is electrolyzed by the passage of a current through it, it decomposes into chlorine, ammonia and hydrogen. The chlorine reacts upon the ammonia and decomposes it with the formation of hydrochloric acid and chloride of nitrogen. When the gases disengaged attain a sufficient pressure the tube bursts, and the shock resulting from this action detonates the chloride of nitrogen, which, as is well known, is one of the most violent of explosive substances.



## BECQUEREL RAYS.\*

If it had not been for the previous discovery of the Roentgen rays, the discovery of the Becquerel rays would have been looked upon as the most remarkable scientific event of the century. These rays have many of the now well-known properties of the Roentgen rays, but in their origin they are unique, since they appear to contravene the law of the conservation of energy and realize the popular ideal of creation of something out of nothing.

A photographic effect, due to the presence of sulphide of zinc, was observed by Henry in 1896, but he supposed that the effect was due to a transformation of the Roentgen rays to which the sulphide of zinc was at the time exposed. Becquerel was the first to show that the photographic effect was due to radiation proceeding from the substance itself, even when the Roentgen rays were not present, and he also showed that a great many other substances besides sulphide of zinc emitted this peculiar kind of radiation. These rays are, therefore, properly named after the real discoverer, Becquerel.

The Becquerel rays, like the Roentgen rays, have the property of passing through all substances, whether opaque or not, the absorption

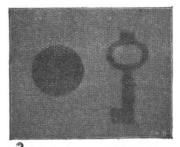


Fig. 1.

being proportional to the specific weight of the substances. Fig. 1, for instance, is a diagraph of a key and coin enclosed in a cardboard box, obtained by exposure to the Becquerel rays. The result is much the same as would be produced by the Roentgen rays; the exposure required is longer, and the outlines are not so sharp, especially if, as in the case of the key, the object is some distance above the photographic plate.

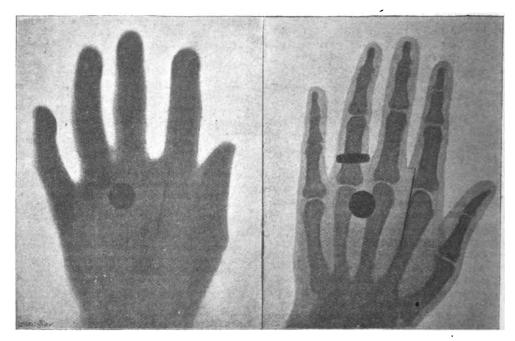
The substances which Becquerel first employed to produce this radiation were the phosphorescent compounds of uranium, that metal which, of all the chemical elements, has the highest atomic weight. Later he found that non-phosphorescent compounds of this metal emitted more or less strong rays of the same kind, and he came to the conclusion that the radiation was probably due to the presence of the metal, and that the pure metal would emit more powerful radiation than any of its compounds. This expectation was fulfilled, and Becquerel on that account called the new radiation "Uranium rays," a name which, however, can hardly be justified, as other substances not containing uranium have since been found. which are even stronger radiators. Of such substances may be mentioned thorium, which comes next to uranium in atomic weight, and is well known as forming an essential constituent of the mantle of the Welsbach gas light.

The discovery of this property of thorium and its compounds was independently made by Schmidt, of Erlangen, and Madame Curie, of

Paris, a lady who soon after distinguished herself by making further discoveries in this field. We have her to thank, especially, for the discovery of two entirely new groups of preparations, whose Becquerel radiation is some hundred times stronger than that of the uranium and thorium compounds previously known. While comparing the strength of the radiation of uranium and thorium compounds, Madame Curie discovered that Bohemian pitch-blende, an uranium ore, had a much stronger action than uranium itself, and in view of Becquerel's investigations, this could only be accounted for by the presence in the ore with the uranium of another more active element. By fractional analysis of the pitch-blende, the most active constituents were gradually isolated, and there turned out to be two such products in the ore. Chemical analysis showed that these two products were compounds of bismuth and barium respectively, but with this difference that the same compounds obtained in other ways did not emit Becquerel rays. The products were looked upon by their discoverer as two new elements, and were named by her "Polonium," and "Radium." The probability, however, is replacing the costly apparatus for the production of Roentgen rays, by a small tube charged with one of these preparations. This question is of especial interest to medical men, and it has recently been thoroughly investigated by Dr. Walter, of Hamburg.

Both the De Haen and the Giesel preparations are capable of exciting the barium platinocyanide phosphorescent screen. The effect is very much weaker than with the Roentgen rays, but with the Giesel preparation the phosphorescence is distinctly visible at a distance of 20 cm. A shadow picture of the human hand can be obtained, but only the outline of the hand is seen, the bones are invisible. Even when the photographic plate is used, the bones are not shown, as may be seen by comparing Figs. 2 and 3. Fig. 3 is taken with the Roentgen rays, Fig. 2 is a photograph of the same hand taken by an exposure of an hour to the strongest Giesel preparation. The bones are invisible in the second case; a needle and coin placed under the hand are visible, but indistinct compared with the Roentgen photograph.

These results dispel all hope of using the radio-active substances for obtaining diagraphs



F1G. 2.

that they are merely allotropic forms of compounds of bismuth and barium; but judgment for the present must be suspended on the question of their elementary character. It has been proposed by Giesel to call them simply "radio-active bismuth," and "radio-active barium."

Giesel, of Brunswick, with the assistance of the well-known physicists, Elster and Geitel, has succeeded at the chemical factory of A. de Haen of List, near Hanover, in making concentrated preparations of the substances discovered by Madame Curie, which far exceed in radio-activity anything that has hitherto been produced. The most powerful substance obtained by Giesel requires that some hundredweights of the ore should be used for the production of a few grams, which of course, makes its cost prohibitive for professional or commercial use, but the De Haen factory manufactures an intermediate product which, though not quite so powerful, can be had at a moderate price.

The immense improvements that have been made in radio-active substances by these investigations has suggested the possibility of

Fig. 3.

of parts of the human body. Walter's investigation leads to the conclusion that the failure of the Becquerel rays to depict the interior parts of opaque bodies is due to their greater diffusion, and to their exciting secondary radiations in the substances through which they pass. The secondary radiations act on the photographic plate and obscure the outlines of the interior forms.

Though Walter's investigations lead to a negative result, they are not the less valuable in preventing users of the Roentgen rays being misled by the many similarities of the Becquerel rays and the X-rays into the belief that the latter can in every case replace the former.

# An Electric Water Filter.

An electrical water filter has recently been brought out, consisting among other things of a tube in which are placed two electrodes. The water in passing from one compartment to another is obliged to circulate through this tube when, according to the inventors, it is purified by being partially decomposed by the electric current into oxygen, hydrogen and by the formation of ozone.



From the "Electrical Review," London.

#### UNION TRACTION PLANT AT PHILADEL-PHIA

BY FRANK C. PERKINS.

The Union Traction Company of Philadelphia have a total length of track of about 450 miles and operate over 3,000 cars. Mr. J. B. Parsons is president and general manager, and C. O. Kruger secretary and treasurer. This company has absorbed practically all the lines in and about the city of Philadelphia, and is now one of the largest systems of street railway lines in the United States. The total power used is in the neighborhood of 40,000 horse power, and is supplied from nearly a dozen stations operating over 30 generators.

The accompanying illustration shows two of the four 1,500 kilowatt direct connected engine type generators in the Mount Vernon street station. This station is in the heart of the city in the busiest section, and continually has a very heavy load.

The generators supply a current of 2,730 amperes at the usual street railway feeder voltage, and operate at a speed of from 75 to

The field castings are divided vertically and set upon a guide plate. The vertical division of the fields affords an excellent facility for immediate inspection or removal of armature or field coils without the necessity of removing the outboard bearing or dismantling the engine. The opening of the fields upon ways in a horizontal direction is a great convenience where head room is limited and cranes or other devices for handling heavy castings are not available.

The armature winding is of interest, and is arranged as follows: The periphery of the armature is slotted. The armature windings are made from bars of drawn copper, forged into proper shape on cast iron formers. After being thus shaped the bars are thoroughly insulated with mica, and prepared fuller-board, and baked to remove all moisture. The coils are held in the slots by means of retaining wedges of hard fiber driven into notches near the top of the slots, parallel with the engine shaft. These fiber wedges can be pressed out should it become necessary to remove any armature coil.

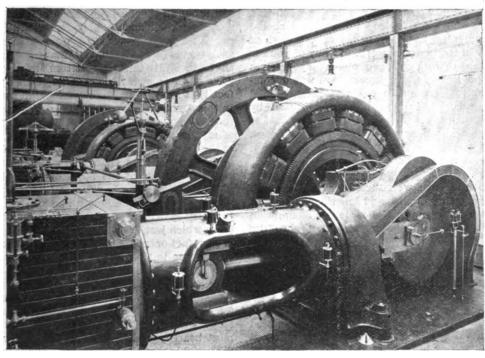


FIG. 1.—ENGINE TYPE GENERATOR OF UNION TRACTION PLANT AT PHILADELPHIA.

80 revolutions per minute. They have a total weight of about 100 tons, and are of the 14 pole type. The field coils are over-compounded to raise the potential as the load increases a total of 10 per cent. The field coils, both series and shunt, are removable when desired, and the series coils are composed of forged copper conductors of rectangular cross section.

The armature core consists of punched sheets of carefully laminated steel, held together by cast steel end plates. This core is built upon an iron spider, and also carries the commutator. The spider is pressed and keyed upon the shaft of the engine, and may be taken off at will should there be any reason to do so, without in any way interfering with the permanent arrangement of the commutator and windings. Ventilating spaces through the spider and armature core are so arranged as to allow a constant circulation of air through the commutator and windings when the machine is running. The general design of these engine type generators is similar to that of the regular multipolar machines, and consists of a circular yoke carrying inwardly projecting pole pieces of laminated soft steel.

The weight of the two main engine bearings is equalized, and the commutator protected from dirt and grease by reversing the ordinary practice and placing on the commutator next to fly wheel.

The switchboard is a double bank, and has tive panels for generators, several instrument panels, and over seventy feeder panels. The bus-bars are arranged so that the total number of feeders may be supplied with current from the four 1,500 kw. engine type generators, shown in the illustration.

The boilers have a capacity of over 7,000 hp., are of the water tubular type, and have an available pressure of 150 lbs. The engines are compound condensing, and drive the generators at 75 to 80 revolutions per minute.

In the motor equipment both single and double trucks are used. Electric heaters are to be found in the cars, of which there are a total of 3,000. The 33d and Market street station also have two 1,500 kilowatt engine type 14 pole generators, and several smaller machines of about 400 kilowatt capacity. Several generators of about 500 kw. capacity are in use at 32d and Dauphin streets,

and at North Delaware avenue. The Willow Grove power house has several belted machines of smaller sizes, and the future equipment will undoubtedly be of the more modern type of construction.

The storage battery equipment of the Union Traction Company of Philadelphia was originally installed at the Chestnut Hill station, and gave excellent satisfaction as a pressure regulator. The battery consisted of 248 chloride accumulators. Each cell had six positives and seven negatives, 15½ inches square, in leadlined tanks. No mechanical connections were used, the plates being lead burned to lead busbars. The cells were installed in two rows on oil insulators upon the tile floor of the battery room. The maximum discharge rate as originally installed was 400 hp. for one hour. The switchboard apparatus controlling the entire operation of the battery, feeder and line, consists of ammeter, circuit breaker and knife switch, in each of three circuits; also the usual voltmeter and recording wattmeters in the battery circuit.

# THE NORTHERN SOCIETY OF ELECTRICAL ENGINEERS.

Abstract of the Inaugural Address of Dr. Ed. Hopkinson, Delivered at Manchester, England, February 27, 1900.

Electrical engineering, though in a sense the most specialized of all branches of engineering, is really the most cosmopolitan, depending upon many branches of fine scientific-mathematics, the whole range of physics, chemistry, and even to some extent the biological sciences, and playing an integral part throughout the vast field of engineering, so that the choice of a subject is a matter of no little difficulty.

English electrical engineering has been, and is, passing through a momentous epoch of its history. Before recovering from a strike of unprecedented length and extent, a period of extraordinary expansion in the general trade of the country, and quite sudden realization by the public of the advantages of electric lighting, electric traction, electric transmission, and distribution of power, and many other applications of electric energy, had led to great demands on both manufacturers and undertakers, for which it cannot be said they have by any means been fully prepared, with the result that large orders for electrical plant have been placed abroad.

Let us take it for granted, for a moment only, for the sake of argument, and we will return to the assumption later, that the conditions in England are generally as favorable for manufacture as they are in other countries; then it is obvious that undertakers, including under the term more particularly municipalities and public companies, who are undertakers in the parliamentary sense of the word, ought not to deprive their own rate payers and constituents of work and order abroad, except by reason of inability of otherwise obtaining delivery in reasonable time or of serious difference in price. Primarily dependent, as they are, for their own prosperity upon the full employment of the working classes of this country, they cannot regard with indifference the passing of any work out of the country which can be done in it; nor can they throw the odium of unpreparedness entirely upon the manufacturers, as it is, I venture to think, as much their business and their interest to so forecast the future as to take such steps for increase of their plant to afford ample time for properly digested plans of extensions, and for the execution of the work, as it is the business of the manufacturer to provide the appliances for construction. Would the nation relieve the Admiralty or war office of responsibility if they suddenly found that they wanted ships and guns with such rapidity and in such quantity that they had to buy in Germany? Would it not rather hold that the departments had shown lack of foresight and due preparation?

I asked you a moment ago to grant, for the sake of argument, that the conditions in England are generally as favorable as in other countries. Are they? a large question with many answers. In one respect it must be admitted they are. English manufacturers find no inducement either in price or in quality to buy their coal, iron or steel, except in relatively infinitesimal quantities from abroad. But are our conditions of labor and our capabilities of design and management equal to those of foreign competitors? I cannot refer to the first without some apprehension, lest I should step on forbidden ground, knowing that opinions are various and and feelings strong; yet for this very reason I think the problem cannot be too freely or openly discussed. Let us compare some of the conditions of labor which obtain with us and those which obtain in the United States. Given a particular piece of work, done in a particular way and with given appliances, I have never seen any evidence to prove that the work is done more cheaply in America. The American workman has higher wages, and probably accomplishes somewhat more in a given time, so that the net result is probably about the same. That the output of an American workman is somewhat greater than that of his British brother is partly due, no doubt, to mere physical causes, a more bracing climate during the greater part of the year, and the fact that American workshops are, as a rule, better lighted, heated and ventilated, than most English shops, and that more attention generally is paid to hygienic conditions; partly to the greater stress which characterizes American life generally, and has grown to be inherent in the national character; but chiefly due to the fact, in my opinion, that American workmen are in general very much better educated than English workmen, not in the sense of mere technical knowledge of their work, but are generally more cultured and have a wider mental horizon. I believe it to be quite a general law of human effort that the better educated a man is the harder he will work at whatever his hands find to do, and that apart from the question of skill of handicraft an educated man will produce more in a given time than the uneducated. The cultured man has more to look forward to when his work is accomplished, and values his earnings and his leisure more highly, and so has greater incentive, and accustomed during his years of early training to constant effort, it becomes a mental and moral habit to work to the utmost of his capacity.

If these considerations be true, we may anticipate the future will bring a gradual increase in the rate of work, as our educational systems become more developed and extended, as, indeed, has no doubt been the case during the last fifty years; but this tendency will bring, and has brought us to face another problem, viz., the time of working. Concurrently with increase in the rate of work there has been a steady diminution in the hours of work, and probably we have not yet reached the limit. The efficiency of a particular manufacturing plant is measured by the ratio of the differ-

ence between the market value of the production and its cost to the capital employed, There are various fixed losses or charges, rent rates, management, and so on, which I need not enumerate; there are other charges which are a function of the time during which the plant is worked, for example, cost of power, lighting, etc., and, finally, there is the cost of labor, which, again, is a function of the hours of labor. Maximum efficiency is, therefore, determined by a linear differential equation. The problem has its counterpart in the determination of the proper size of a conductor for the transmission of electric energy, the solution of which is expressed by Lord Kelvin's rule; or it is, perhaps, still more analogous to the problem, when is a dynamo working at a maximum efficiency? The answer to which is, as you know, when the C? R losses in the armature are equal to the sum of all other losses. Unfortunately, dynamos never do work at their point of maximum efficiency, as long before then injurious sparking takes place, and the armatures are overheated. Possibly similar phenomena would occur in our workshops if you endeavor to apply too vigorously the solution I have indicated. The solution depends primarily on the function you choose to represent the dependence of the cost of labor in the hours of work. If any of you are inclined to work out the problem for yourselves on the lines I have suggested, I would commend to your notice the very excellent and truly scientific investigation recently made by Mr. Crompton into a corresponding and just as difficult a problem, the proper length of crank in a bicycle, pointing out in passing that in general a long crank corresponds to short

But to return, we assumed for the argument in comparing English and American labor that the appliances were the same, an assumption at the present time certainly not generally justified by the facts. American electrical industry, at any rate, is so much more concentrated into comparatively few shops on a larger scale than most of our English shops that there has been far greater possibility of standardization in every detail, and repetition of types, and consequent inducement to the introduction of automatic machine tools: but our workshops are changing in this respect, and any ground we may have relatively lost may be regained, and certainly will be recovered if those responsible for the laying out of our electrical undertakings realize that machinery of standard size and manufacture is not only cheaper, but intrinsically better and more accurate in workmanship than machinery built to suit their own particular idiosyncrasies. Who would think of asking a Lancashire boiler maker for a boiler 29 feet by 7 feet 9 inches, instead of 30 feet by 8 inches, because he wanted 5,800 lbs. of steam per hour instead of 6,000; but too often is the builder of an electrical plant forced to design his plant to fit the station, and to meet all manner of conditions which ought to have been subservient to the plant.

No doubt the introduction of automatic machine tools in England has been, and is, attended by many difficulties with the work people, but I am optimistic enough to believe that as our work people become better educated and more intelligently alive to their own interests these difficulties will rapidly disappear. This is not by any means necessarily coincident with the larger adoption of piece work, and will not, I think, be solved by this means. Piece work is open to many objections, and

often breaks down. Rightly or wrongly, it is always regarded with suspicion by the English working man, and is often unsatisfactory to the employer. Though in some American shops it has been adopted to a large extent, with satisfactory results, there is much less piece work in practice in America than is generally supposed. The largest engine-building shop in the world has no piece work whatever, but a modification of it, with which you may perhaps not be acquainted, but it is well worth study. and is largely obtaining in America. I refer to the system known as the "premium" system, where the workman, while receiving in any case his rated wages, has a definite price fixed for each piece of work, and divides with the employer according to an agreed scale any profit made by producing at a lower cost than the fixed price.

Once more return to an assumption I made in an earlier part of my remarks, viz, that the management of our English manufacturing or undertaking business is on a par with that of corresponding businesses in the United States, and under the word "management" I would include not merely shop and works management, but all that makes for intelligent and scientific design and technical control. I will not attempt an answer as to whether the assumption is justified, but it is worth noting that our American competitors have given proof of their own views on this point by the fact that more than one are establishing works in this country. They, at least, must have come to the conclusion that the general conditions of manufacture are as propitious in England as they are in the States, that labor difficulties are no greater here than there, but that by the introduction of the appliances they have so well worked out, the systems of shop management, and the designs and technical control they have elaborated, they look for advantages which justify their emigration. Whether it be a fact or not that we have any leeway to make up in this direction, it is at any rate a profitable reflection to consider how we may have lost ground, if lost it we have,

This leads us into the large field of the right training of electrical engineers and managers for our electrical undertakings. I for one would most heartily endorse the dictum of Sir Andrew Noble that the education of our English public schools and universities lays a foundation for successful struggle in the world's field of battle which is absolutely without rival, but is a foundation only; upon it must be built an adequate superstructure of technical knowledge and skill. Much progress has been made in England, but it must be admitted we are still far behind, which I venture to think is chiefly due to the want of frank recognition of hearty co-operation, not on the part of our public men, but of our managers and designers with the admirable institutions which already exist in this country. In laboratory and experimental equipment the technical schools and technical branches of the American universities far excel anything we have-with few exceptions-in this country, and it is not provided for the most part out of beer money or local taxation, but is the free and generous gift of manufacturing concerns and the captains of industry in the country, who are far sighted enough to realize that by such support they are taking the first steps toward building up and ensuring the lasting prosperity of their own industries. We in the North of England have the opportunity afforded us for like support by the splendid institutions at our very



doors, our university colleges and our municipal technical schools, all of them now provided with, or rapidly making provision for, adequate laboratories and workshops and most scientific teaching, and lacking only the earnest co-operation of the responsible managers and controllers of our undertakings. As a significant illustration of what I have been saying, I may mention that the professor of engineering at Cambridge told me a few days ago that the management of a large American concern about to start in this country recently applied to him to recommend a dozen of his students to take responsible posts, after brief further training in America, believing that nowhere else could they obtain better material for their purpose.

If in the future the scientific training in a technical school or the technical departments of our universities is to largely replace the old systems of apprentices and pupilage, a much wider responsibility is thrown on the teachers and professors than the mere imparting of knowledge or development of manipulative skill. It rests with them to teach the general principles upon which all successful manufacture must be based, and to influence the entire mental attitude of their pupils toward the profession for which they are training. If they fail in this they may indeed instruct but will not educate; and we shall have a new class of "technics" who will hinder rather than promote industrial progress. To avoid such dangers we cannot insist too strongly on the importance of the closest possible co-operation and interchange of opinion between the responsible and practical managers of our industries and members of the profession on the one hand, . and the managers and teachers of our technical schools on the other hand. The free interchange of opinion and discussion of methods is essential to the welfare of both.

Take two illustrations of such general statements. We have been talking much of late, but doing less, towards standardization of electrical work. Manufacturers know perfectly well the need of it, but are practically powerless as they have no option but to provide what they are asked for. Now, if the profession generally could agree from time to time upon certain standards, and every young engineer before he leaves school or college be trained to repeat them, to understand the reason for them, and to look upon departure from them without cogent cause as bad practice, they would very soon be universally adopted. Or as another example, I suppose nine-tenths of educated opinion in England has been for the last 10 or 20 years in favor of the adoption of the metric system as tending toward more accurate work, involving much saving in labor of computation, and facilitating our relations in foreign markets. Enlightened manufacturers are fully alive to its advantages, but cannot make headway against the mere dead weight of characteristic English dislike to change. Now, if the teachers in technical schools would be bold enough to agree to write all their text-books in the metric system, set every problem or example in it and make their pupils think in centimeter-grammes instead of foot-pounds, and be allowed to translate their results into hundredweights, ounces, drams, pennyweights, inches, sixty-fourths of an inch, and any other of our national abominations, as valuable arithmetic exercise only, we should very soon have such a preponderance of influence in favor of the metric system that its national adoption would no longer be delayed. Technical education does not end in school or college, but must be continued through life, and one at least of the chief instruments of it is our technical press and the publications of our technical societies.

We, members of the late Society of Northern Electrical Engineers, after seven years of individual growth, have just taken an important step in this direction by our willing amalgamation with the older and more influential Institution of Electrical Engineers in London, which, while leaving us full control of our local organization will, I am convinced, greatly conduce to increased usefulness and promote those objects with which our society was founded. The time will, I trust, come when the same influence working in other channels and with stronger currents will finally lead to the combination of all British engineers, whether civil, mechanical, naval, or electrical, purely professional, or engaged in the control of manufactures, into one great institution, with a roll of at least 20,000 members, and an income sufficient to provide not only a great central house and library in the metropolis, but also subsidiary houses and libraries in the chief centers of industry, and to ensure the rapid publication in convenient form of all new work which will widen the knowledge and resources of engineers, stronger than any of the trade guilds of the middle ages, or the great corporation of the learned professions, maintaining and extending the prestige, honor, and usefulness of British engineers throughout the world.

# IMPROVEMENTS IN WHEATSTONE AU-TOMATIC TELEGRAPH APPARATUS \*

Telegraphic apparatus for high-speed working is necessarily subject to exceptional wear and tear, and it is principally in attention to points of detail in construction that such wear and tear can be diminished. In the ordinary form of Wheatstone transmitter the contact

sometimes finds its way down between the electrical contact points, thereby rendering their action uncertain.

Again, in the ordinary form of instrument, the pivoting of the crank levers and horizontal levers is formed by flattening the ends of the wire forming the lever to the thickness of paper, and drilling a hole, into which a pin in the crank lever passes. The friction between the lever and the pin soon causes the hole in the thin metal to "draw" and throw the instrument out of adjustment. The adjustments, moreover, of the horizontal levers are made by nuts on each side of the contact lever, and are consequently very difficult of access and adjustment.

Mr. J. Willmot, superintendent of the Postal Telegraph Instrument Factory, has had these defects in view, and with the object of overcoming them, has introduced the following improvements:

1. Substitution of a permanent magnet for the spring and jockey roller now used for holding over the vibrating contact lever. adaptation of the magnetic arrangement entirely removes the downward pressure of the jockey spring, and greatly increases the holding-over force operating upon the contact lever, thereby causing more perfect impact and, consequently, contact between the contact points. The force necessary to drive the instrument when fitted with the magnetic arrangement is considerably less than with the jockey roller, due to the fact that the downward pressure on the pivots is entirely removed, also, as the pull is directly from side to side, and obeys the laws of magnetism, no sooner does the lever commence to move from the pole of the permanent magnet to which it is nearest, than the attractive force of that pole decreases as the square of the distance, and at the same time the pulling power of the pole to which it is approaching increases in a like proportion, a condition most favorable to the object in view.

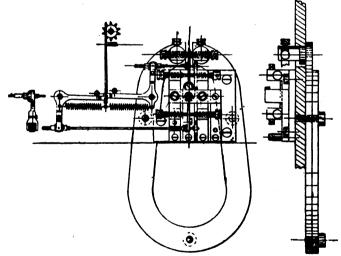


FIG. 1.—MAGNETIC BIAS FOR AUTOMATIC TRANSMITTERS.

lever is held over to the contact points by means of a spring and jockey roller operating upon the end of the lever. This arrangement not only necessitates a considerable movement of the lever to get upon either side of the center of the roller, but a heavy downward pressure is caused which has to be overcome by the contact lever in passing from side to side. There is considerable friction between the jockey roller and the end of the lever, and a lubricant has to be used to reduce it. This

The arrangement of the improved apparatus is shown by Fig. 1.

With the spring and jockey roller arrangement it is necessary to continually lubricate the roller, the oil thus used finding its way between the electrical contact points. With the magnetic arrangement this defect is entirely removed.

2. Substitution of properly-pivoted crossheads for the holes and pin joints of the horizontal levers, and arranging the screw adjustments in such a manner to permit of easy and convenient access. This arrangement con-

<sup>\*</sup>From the "Electrical Review," London.

siderably reduces the wear and tear of the instrument, and consequently prolongs its life.

Another important improvement which Mr. Willmot has introduced, and which has proved a great success, relates to the Wheatstone "perforators."

The punches of these perforators require frequent sharpening in consequence of the edges of the punches wearing away by the action of the oiled paper perforated. This is principally due to the fact that at each blow of the punch a film of dried oil is deposited by the paper upon the surface of the punch, which

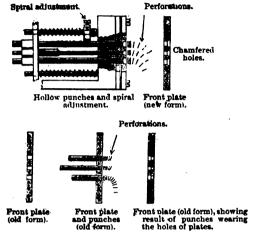
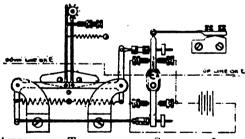


FIG 2.—WILLMOT PUNCHES.

soon builds up into convex form, the consequence being that the paper is bent over the punch before being perforated, and quickly wears away the cutting edge of the punch. The punched-out portions of the paper being bent by this process are sluggish in leaving the perforated plates.

To remedy these defects Mr. Willmot has devised a punch having a hollow recess at its end, as will be seen in Fig. 2; it having no center on which a deposit of oil can take place, the surface of the punch remains flat and makes a clean perforation. It has a further advantage, i.e., that in coming into contact with the paper to be perforated a small amount of air is compressed in the recesses of the punches, which air, after the perforation has been



AUTOMATIC TRANSMITTER, SHOWING JOCKEY WHEEL AND SPRING.

made, tends to blow away the punched-out portions of the paper, and also to prevent any oil or foreign matter accumulating in the recesses of the punches. When they require sharpening, the hollow or recessed punches are more easily ground and a flatter surface obtained than is possible with solid punches, because, firstly, having no center there is less metal to grind away; and, secondly for the same reason, they lie more flat upon the cutting surface of the oil-stone used for the purpose of sharpening.

Stone is being hauled from a quarry near Cleveland, O., by trolley. Fifteen thousand pound capacity freight cars are used, and the work is done after the close of the passenger traffic.

#### PARIS LETTER.

(Special Correspondence of Electricity.)

# Universal Metering Apparatus for Electric Cars.

M. Jacques Ullmann, a constructer of Paris, has just invented the above apparatus. We understand how necessary it is for the motorman to constantly know the output of the motors. This invention enables him to tell the rail-section on which his car is running and gives him useful indications how to operate the handle of the rheostat. A knowledge of the available storage battery voltage is equally useful, as it helps him to avoid more easily the often disastrous battery troubles, due to an over-discharge. To avoid the continual watching of two dial needles on the part of the motorman a simplification is required. amperemeter and the voltmeter are in the same case, and to overcome the periodic movements it is necessary to have two galvanometers of the Weston type with movable frames placed in the inter-air space of powerful horseshoe magnets. The voltmeter is graduated up to 120 volts for common automobile purposes. The amperemeter has two distinct graduations on both sides extending from zero. The left hand graduation indicates the battery charge, the right hand one indicates the discharge. The first named meter is graduated up to 40 amperes, the latter one to 100 amperes. As the scale is given in different colors no confusion is possible. In order to avoid passing the cables through the amperemeter the latter measures the intensity of the current by the potential difference at the terminals of a shunt inserted in the main circuit and fixed at any designated place in the car. Flexible wires are used for connecting the terminals of the instrument with those of the shunt. The magnets of the voltmeter and of the amperemeter are set in such a way that they cannot reciprocally influence each other. Cores are used for strengthening the magnetic flux, reducing at the same time the inter-air space to the minimum required by the set of movable frames which carry the needles. There is a set of spiral springs made of aluminum-bronze, one set for each movable frame and they act in opposite direction on the same frame in order to obtain a stability of the needle at the zero point. The needles are balanced and move in two parallel planes, separated by a space of several millimeters, so that they cannot touch one another.

# Experiments With a Remarkable Steam Engine.

Experiments have been made with a steam engine in the presence of civil engineering specialists at the works of Boulte & Larbodiere at Aubervilliers, near Paris, showing a remarkable progress in the manufacture of high-speed engines. This engine has two sets of compound double-acting tandem cylinders with pressure lubrication. It can normally develop 150 effective hp. at an initial pressure of 7 kilograms, and at an "angular" speed, heretofore unknown, 900 revolutions per minute. Torpedo boat engines make only 650 revolutions. The engine has been tested at a pressure of 26 kilograms per square centimeter. It is built entirely of steel, cast-steel and aluminum and weighs less than 600 kilograms, which is about four kilos less per normal effective hp. It does not appear doubtful that this apparatus will facilitate the solution of light power "electrogens" for automobiles, etc. We are glad to mention this initiative coming from French works. These new high-speed engines embody such real progress that they have already been adopted by several important industrial corporations, among others by the Compagnie Française, Thomson Houston, Or leans Railroad Company, Electric Illuminating Company, Pasteur Institute, Bois de Boulogne Railroad Company, the Compagnac Coal Mine Company, the Compagnie Electrique du Secteur des Champs Elysées, the Société de Transports Maritimes de Marseilles, and others.

#### The Dussaud Telephone.

At one of the last sessions of the Paris Academy of Sciences, M. Dussaud presented and operated successfully a new telephone, which is an interesting improvement, as his instrument permits the registration of messages during the absence of the person to whom they are addressed. M. Dussaud's apparatus comprises a transmitter and a receiver, both having several vibrating diaphragms acting in unison, which gives a sufficiently strong effect to register the spoken words and to repeat them whenever desired. This system will register news to daily papers telephonically, also administrative orders, theatrical performances, and even speeches by means of a transmitter placed under the orator's desk. Experiments have been made between Paris and Lille, and Paris and Marseilles, and the results are said to be very satisfactory.

### LONDON NOTES.

# [From our London Correspondent.] The Physical Society.

At the meeting of the Physical Society on March 2 there was a paper and discussion on "The Relative Rates of Effusion of Argon, Helium and other Gases." The paper was read by Dr. F. G. Donnan. This was followed by a contribution from Mr. E. C. C. Baly on "The Distillation of Liquid Air and the Composition of the Gaseous and Liquid Phases." Dr. Lehfeldt then read a paper by Mr. T. S. Moore on "The Reversibility of Galvanic Cells." In these experiments the reversibility of cells such as a Daniell and the Clark, which are assumed to be reversible, was tested by allowing the cell to send a current, and by sending a current through the cell. The EMF.'s of the cells were determined by means of a Crompton potentiometer, and from the EMF.'s on open and closed circuits the internal resistances of the cells were calculated. In course of a brief discussion on the paper Prof. Silvanus Thompson asked whether the author had made experiments upon Leclanché cells where the products of the action escaped, and in reply Dr. Lehfeldt said that experiments were not made upon these cells because they were known to be reversible.

# The Metropolitan Supply Company's New Station.

The new generating station of the Metropolitan Electric Supply Company at Willesden is now in full swing, and the public inspection took place on March 2. Lord Kelvin, Sir W. H. Preece, Prof. S. P. Thompson, Mr. S. Z. de Ferranti and a large party of electrical men and others being in attendance. The capacity of the works will be 27,000 kw. The generators were made and installed by the Westinghouse Electric Company of Pittsburg, the sets being the largest in use in English lighting works. Current is transmitted to transforming stations

in London for supply to consumers. These stations are situated at the generating works at Amberley Road, Paddington; South street, Manchester Square; and Rathbone Place, Oxford street. The electrical engineer for the Metropolitan Company is Mr. Reginald Todd. The company supplies 500,000 lights.

#### Glasgow Telephone System.

The Glasgow Corporation has advanced a step farther in regard to the establishment of a municipal telephone service. It has before it recommended for adoption by a special committee a scheme to cost at first \$600,000. Mr. A. R. Bennett is acting as consultant for the undertaking, and he has advised a complete exchange for 5,250 metallic circuit lines together with 50 public telephone call offices in the city and suburbs.

# The London Telephone Service.

It may be remembered that the plans recently announced, and now maturing, for bringing about an improvement in the English telephone service, include the granting of municipal exchange licenses for provincial towns and districts, while they involve for London a competitive service to be established by the General Post Office. Several towns are now taking active steps for establishing municipal exchanges, but so far no actual contracts have been placed, and the only parties who have yet profited are telephone consulting experts. As regards the London service, the General Post Office authorities have made large contracts for a telephone plant and underground wires involving an expenditure of about £500,000 out of the £1,250,000 which the London exchange is expected to cost. The Post Office has, like the National Company with which it will compete, been much delayed by local authorities exercising their autocratic rights over roadways, etc., but this is now past and it is expected that the Post Office will be able to afford telephonic communication by the end of the year in nearly the whole of the city area and many suburban districts within the London region.

# Polarization of Light.

A series of lectures on the above subject is being given before the Royal Institution of London by Lord Rayleigh. On the occasion of the first lecture, March 3, his lordship began by performing some of the leading experiments on the subject, and explaining some of the leading points in the theory. The first thing to raise the problem of polarization was the phenomenon of double refraction, noticed more than two centuries ago by Erasmus Bartholinus, when experimenting with a piece of Iceland spar. Lord Rayleigh showed the effect by means of a sphere of Iceland spar from the collection of the late Mr. W. Spottiswoode, presented to the Institution on the occasion of its centenary last year, and pointed out how by turning round the crystal the images of the beam passing through it could be separated to various distances, being always of different sizes and at different focuses. A similar experiment was next performed with a doubleimage prism, and it was proved that in the prism the light from the lamp had suffered change in some respect, by studying the effects of introducing a second double image prism behind the first. In fact, the condition of light known as polarization had been produced, or in Newton's words, the ray had sides. The lecturer next described how tourmaline could be employed to show this "sided" character of light, and proceeded to discuss the manner of accounting for these phenomena, regarded from the point of view of the undulatory theory of light. After briefly summarizing the characters of wave motion, he showed how the supposition that light consisted of transverse vibrations at once afforded an explanation of polarization, thus taking a vertical ray of light the vibrations in the north and south direction would correspond to one sort of polarization, and those in the east and west to the other. Having illustrated this by a mechanical model, he described another method for obtaining polarized light, or for determining whether any particular light was polarized or not, which did not depend, like those already mentioned, on a double-refracting crystal. This was by the reflection and refraction of a beam at the surface of any ordinary transparent substance. The law for determining at what angle reflection must take place in order that the light should be as completely polarized as possible was stated empirically by Brewster, and has since received a theoretical explanation. Some experiments with piles of glass and mica plates concluded the lecture.

#### The Patent Office Exhibit at the Paris Exposition.

Mr. E. B. Moore, who has been appointed by the Secretary of the Interior to accompany the exhibit of the Patent Office to the Paris Exposition, will leave New York to-morrow, the 29th inst., on the steamer La Touraine.

The Patent office exhibit, comprising 208 models, stored in 30 cases, is at present under bond in Paris and can be released only upon personal identification by Mr. Moore. The exhibit will be made in the United States Department of Machinery and Electricity in the building situated in the Champs de Mars.

"The exhibit," said Mr. Moore, "is not as large as was originally intended, owing to the fact that it was selected in great haste. After the decision of the Attorney General that the models could not go out of the United States, the idea of an exhibit was given up entirely and it was not until Commissioner General Peck had a special act of Congress passed au-thorizing the loan of the models to the Exposition that the work of collecting and classify-ing them began. This was only a short time ago, and it is remarkable that so much has been accomplished."

The exhibit consists principally of electri cal devices, comprising the more important inventions of Thomas A. Edison, whom Paris regards as a veritable wizard; H. C. Maxim, the inventor of the celebrated gun of that name; C. F. Brush, of electric-light fame; C. J. Van Depoele, Thomson and Houston, and others. Among the devices of Edison to be exhibited are the printing telegraph and the magneto-electric machine, considered the latest application of the principle of magnetic

electricity.

Many of the devices are interesting from having been the subject of considerable litigation, and the entire exhibit is designed chiefly with a view to illustrate the growth of electrical science from pioneer inventions to the latest and most marvelous developments.

On March 31, the American Circular Loom Company will remove their Chicago office from the Marquette Building, taking a well-fitted and commodious store at 141 Clinton street, where they will carry a large stock of steel conduit "Electroduct." conduit "Electroduct." Geo. W. Patterson, their Western representative, will continue to also handle the Gordon Primary Battery, which line he reports especially prosperous this spring, the Western business having doubled in the last six months, owing principally to the extensive adoption of the Gordon cell in central and an arrange of the control o tral energy telephone work.

#### OBITUARY.

#### Darius Colombani.

Mr. Darius Colombani, the well-known church electrical decorator, died at his home in this city on March 21.

Mr. Colombani was born in Italy in 1850, and after coming to this country interested himself in matters electrical. His early training and favorite studies had inclined his mind to the subject of symbolical church decoration, and it was only natural that the idea of applying electricity to this purpose should present itself to him. In 1889, after considerable opposition on the part of ecclesiastical authority, Mr. Colombani obtained consent to light with electricity the church of the Holy Innocents on West 37th street, New York. After this followed the installation of electric-light deco-



DARIUS COLOMBANI.

rations in St. Francis Xavier's, St. Bernard's, St. Agnes's, St. Francis d'Assisi, St. Patrick's Cathedral and many other sacred edifices.

Mr. Colombani was at one time connected with the Edison Electric Illuminating Company of this city, and was also with the Metropolitan Electric Equipment Company. He was twice married, and leaves a wife and a son by his first wife to mourn his demise.

# Amelia Dickinson Pope.

Amelia Dickinson Pope, widow of the late Franklin Leonard Pope, died of heart failure in Amherst, Mass., on March 20. The funeral service was held at Amherst on the 22d and the interment was at Great Barrington, Mass., on the following day. Her only son Leonard is at Amherst College, the eldest daughter Anna at the University of Wisconsin, and the youngest daughter Amy at Smith College, Northampton,

### Bernard M. Shanley's Funeral.

Bernard M. Shanley, the millionaire trolley magnate, was interred Friday in the cemetery of the Holy Sepulchre in Newark, N. J. The funeral is reported as the largest ever held in that city. The pallbearers were ex-United States Senator Smith, John D. Crimmins, David Young, Jeremiah O'Rourke, Dr. Leslie B. Ward, Elisha B. Gaddis, Peter Hauck, Judge Gottfried Krueger, Arthur Devine, ex-Senator Stolesbury, Philip N. Jackson, Edward, F. C. Young, Frank Sheppard, and Randall Morgan,

#### LEGAL NOTES.

The Menominee (Mich.) Electric and Mechaninal works were recently turned over to A. W. Stein of Chicago, a receiver in bankruptcy petition. The company's liabilities are \$37,-000; assets, \$10,000.

Judge Swan in the United States District Court of Detroit, Mich., has rendered a decision which denies the validity of an ordinance passed several months ago by the city council requiring the street railway companies to reduce rates of fare to three cents. The court says that there is nothing in the charter of the city which authorizes such an ordinance, and grants an injunction to restrain the city from enforcing it. Judge Swan said in the opinion: "To enforce this ordinance would be an act, not of regulation, but of spoliation. The police power includes the general management as regards the protection of life and property and the accommodation of the public, but the Legislature itself could not effect the fares agreed upon. It might be for the welfare of the public that the fares should be abolished altogether, but that would be confiscation, and could not be tolerated." The court holds that the substance or meaning of all these ordinances permits five-cent fares, which privilege cannot afterward be annulled.

#### American Institute of Electrical Engineers.

The 141st meeting of the Institute will be held at 12 West 31st street, New York City, this (Wednesday) evening at 8 o'clock. A paper will be presented by Joseph Sachs, entitled "The Evolution of Safe and Accurate Fuse Protective Devices."

Applications have been received from the following candidates for associate membership, which will be acted upon by the council at its meeting April 25:

Walter D. Stelle, J. H. Livsey, Detroit, Mich. J. J. Oolgaardt, Walter I. Slichter, John B. Barr, John Peabody Moore, Schenectady, N. Y.

Cloyd Marshall, Indianapolis, Ind.

J. M. Leamy, Ottawa, Canada.

Manuel B. Gutierren, Jalapa, Mexico.

Gabriel Fernandez Somellua, William Howard Cole, William Hendrik de Waal, Mexico City, Mexico.

Marshall Osborne, London, England. Julio Guerrero, Durango, Mexico. William Hand Browne, Jr., Urbana, Ill. William W. Hanscom, San Francisco, Cal. William James McClure, New York City. Richard Varley, Jr., Jersey City, N. J. Next meeting is in New York, April 25.

The annual meeting will be held in New York, Tuesday, May 15. The general meeting will begin at Philadelphia in the afternoon of May 16.

## PERSONAL MENTION.

Mr. Charles F. Brush, of Cleveland, O., has won the Rumford medal of the American Academy of Arts and Sciences by the discovery and development of the electric are lamp.

Mr. Louis Uhlman, aged 26, an electrical inventor of promise and first assistant of Nikola Tesla, died recently in Phoenix, Ariz. Tuberculosis was the cause of death. Mr. Uhlman, his friends say, was a photographer of rare ability and the inventor of photographic processes and supplies.

Mr. John M. Roach, general manager of the Chicago Union Traction Company and president of the American Street Railway Association, is in receipt of an urgent invita-tion to be present at the International Tramways Congress. to be held at the Paris Exposition next September, and to take part in the discussions.

Mr. J. R. Bullard, one of the chief promoters of the first electric street railroad in Dedham, Mass., and president of

the Dedham Electric Lighting Company, died at his home a short time ago.

Prof. L. J. Blake, who is at the head of the school of electrical engineering in the University of Kansas, has been elected to membership in the American Physical Society. This society, recently organized in New York City, aims to fill the same position in this country that the Philosophical Society does in England.

Mr. P. D. W. Hankey, manager of the Gettysburg (Pa.) Electric Light, Heat & Power Company, and assistant man ager of the Gettysburg Transit Company, died recently at his home in Gettysburg from the effects of a stroke of apoplexy.

Mr. Babert V. Eiseck, a Japanese mechanical and electrical engineer, has been in Pittsburg, Pa., for the purpose of getting ideas and preparing plans in connection with the building of industrial plants in Japan.

#### INCORPORATIONS.

The Colorado Springs Electric Company, Colorado Springs, Col. Capital stock, \$1,000,000. Incorporators: W. P. Bonbright. William A. Otis and Leonard E. Curtis, all of Colorado Springs

The Stanley & Patterson Company, New York City-to manufacture electrical apparatus. Capital stock, \$200,000. Directors: A. F. Stanley of Brooklyn, G. L. Patterson of New York and A. S. Deveau of Mount Vernon.

The Consolidated Light, Heat & Power Company. Camden, N. J.-to furnish electric light, heat, gas, etc. Capital stock, \$500,000, Incorporators: F. A. Magowan, B. C. Warnick, J. W. Weart, all of Camden.

The Crandall Electric Monogram Company, New York City. Capital stock, \$50,000. Directors: Silas B. Dutcher, Lucien S. Crandall, James R. Davies, M. C. Ebel and Norman S. Dike of Brooklyn.

The Yardley Electric Light, Heat & Power Company, Yardley, Pa.-to supply light, etc. Capital stock, \$25,000. Incorporators: E. J. Moore, S. J. Moore, Jr., T. A. Royal. Jr., J. MacFadden, R. Remont, all of Philadelphia, Pa.

The New Era Electric Drill Company, Colorado Springs Col. - to manufacture and sell electric drills. Capital stock, \$1,000,000. Incorporators: A J. Clark, H. N. Hawkins, J. McDonough, M. C. Jackson, W. Thorn, W. C. Allison, all of Colorado Springs.

The Electric Log Recorder Company, San Francisco, Cal.to deal in electric log recorders. Capital stock. \$30,000 Incorporators: F. M. Munger, L. W. Storer, L. T. Jones, W. B. Armstrong, all of San Francisco, and J. Mills of Oakland.

The Detroit Electric Piating Company, Detroit, Mich. Capital stock, \$10,000. Stockholders: Howard G. Harris William H. Thayer, George McClusky and Louis W. Wheeler.

The Novelty Machine & Electric Company, Wheeling. W. Va. Capital stock, \$50,000. Incorporators: R E. Schubert, Charles Menkemeller, George E. Kurner, H. G. L. Fredreichs and A. H. Weidebusch.

## COMMERCIAL PARAGRAPH.

Elsewhere in this issue will be found the advertisement of the Jewell Electrical Instrument Company. 439 Marquette Building, Chicago. This well-known concern has on the market direct current ammeters, milli-ammeters, voltmeters and milli-voltmeters, made up in switchboard, portable and laboratory style. All of these instruments are of the D'Arsonval type, having a coil moving in the field of a permanent magnet. The permanent magnets are made from imported magnet steel, and are thoroughly aged before being placed in the instrument. The springs are made from a special low-resistance, phosphor-bronze alloy having a fine temper. The series coils in the voltmeters and the shunts in the ammeters are made from an alloy having a zero temperature coefficient. The voltmeters have a resistance of about 120 ohms per volt of scale. i. e., a 0-150 voltmeter has a resistance of 18,000 ohms. The special features of this instrument are rigidity of construction, dead-beat qualities, constant temperature coefficient of the instrument, which is stated to be unaffected by changes in temperature, and handdrawn scales from recognized standards, which insure correct readings. The scale divisions are uniformly spaced, and there can be no magnetic lag, as there is no iron in the moving parts; the scale readings begin at 0. Only a small amount of energy is consumed by the meter, a 150 voltmeter, consuming but 114 watts on the full deflection. The makers claim fair accuracy for the instruments in all positions and absolute accuracy in the position in which they are calibrated, whether vertical or horizontal. A device for eliminating the effects due to static electricity is included. The scale is adjustably operated by a small, milled head, partially projecting through the case, which on being turned by a rub of the finger, operates a micrometer screw which in turn shifts the entire scale, bringing its zero to the zero position of the needle should the latter become bent by any mishap.

#### ELECTRICAL PATENT RECORD.

This department is edited by OSCAR A. MICHEL. Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 502 and 504 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR 4. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon payent of ten cents. When ordering give name, date and title of invention wanted.]

#### LETTERS PATENT ISSUED MARCH 20, 1900.

#### ELECTRIC RAILWAYS AND APPLIANCES.

ELECTRIC RAILWAYS AND APPLIANCES.
645,552. Combined Sleeper and Conduit for Electric Railways. William Courtenay, New York City. Filed July 17, 1899.
645,615. Electric Insulation for Railways. James E. Wright, Omaha. Neb. Filed Feb. 25, 1899.
645,646. Electric Railway. Edmund C. Morgan. Chicago, Ill., assignor to the Electric Haulage & Manufacturing Company, Brazil, Ind. Filed Sept. 2, 1898.
645,647. Third or Traction Rail for Electric Railways. Edmund C. Morgan. Chicago, Ill., assignor to the Electric Haulage & Manufacturing Company, Brazil, Ind. Filed Nov. 30, 1898.
645,648. Electric Railway. Edmund C. Morgan, Chicago, Ill., assignor to the Electric Haulage & Manufacturing Company, Brazil. Ind. Filed Nov. 30, 1898.
645,643. Third Rail for Electric Railways. William A. P. Willard. Jr., Hull. Mass. Filed July 13, 1899.
645,765. Controlling Apparatus for Electric Cars. August Sundh, Yonkers, N. Y. Filed Aug. 17, 1899.
645,765. Controlling Apparatus for Electric Cars. August Sundh, Yonkers, N. Y. Filed Aug. 26, 1899.
645,893. Signal for Railways. Clarence A. Stimpson, Philadelphia, Pa. Filed Aug. 8, 1899.
ELECTRIC LIGHTS AND APPLIANCES.

# ELECTRIC LIGHTS AND APPLIANCES.

645.784. Electric-Arc Lamp. Edward L. Bowen, McComb City, Miss. Filed Dec 8, 1839.
645.848. Electric-Light Hanger. Duncan Brown, Vancover, Canada. Filed-Oct. 21, 1859.

#### ELECTRICAL MACHINERY AND APPARATUS.

ELECTRICAL MACHINERY AND APPARATUS.
645.671. Electric Meter. Edwin W. Rice. Jr.. Schenectady,
N.Y., assignor to the General Electric Company of New
York. Filed Dec. 20, 1899.
645.675. High-Potential Apparatus. Elihu Thomson. Swampscott. Mass., assignor to the General Electric Company
of New York. Filed Dec. 26, 1899.
645.684. Electrically-operated Switch. Edward M. Hewlett.
Schenectady. N. Y., assignor to the General Electric
Company of New York. Filed — 30, 1898.
645.690. Section Insulator and Switch Therefor. George R.
Mair. Schenectady. N. Y., assignor to the General Electric Company of New York. Filed Dec. 11, 1899.
645.767. Controller for Electric-Railway Cars. August
Sundh, Yenkers. N. Y. Filed Sept. 25, 1899.
645.774. Continuous-Current Transformer. Alfred Wydts
and Gustave Weissmann, Paris, France. Filed May 12,
1899.

645.809. Controlling Device for Electric Switches. W. Hammer, Chicago, Ill. Filed Aug. 31, 1899.

## TELEPHONES AND TELEPHONE APPARATUS.

TELEPHON ES AND TELEPHONE APPARATUS.
645,570. Telephone Appliance. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed June 15, 1896.
645,571. Telephone-Exchange Apparatus. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Nov. 16, 1896.
645,572. Automatic Calling Appliance for Telephone Trunk-Lines. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed March 9, 1898.

Western Electric Company, same place. Filed March 9, 1898. 645,917. Telephone-Call Register. William Gray. Hartford. Conn., assignor to the Gray Telephone Pay Station Com-pany, same place. Filed Oct. 12, 1898.

## MISCELLANEOUS.

pany, same place. Filed Oct. 12, 1898.

MISCELLANEOUS.

645,573. Electric Mine-Bell. Barry Searle, Montrose, Pa. Filed Aug. 7, 1899.

645,576. System of Transmission of Electrical Energy. Nikola Tesla. New York City. Filed Sept. 2, 1897.

645,588. Fire-Alarm Apparatus. Albert F. Doddridge, Chicago, Ill., assignor of one-half to Morton M. Curry, same place. Filed Oct. 28, 1899.

645,693. Device for Locating Grounds on Electric Circuits. Matthew J. Meyers. Syracuse. N. Y. Filed June 17, 1896.

645,612. Method of Distributing Energy. George Westinghouse, Pittsburg. Pa. Filed Jan. 11, 1899.

645,613. Apparatus for Distributing Energy. George Westinghouse, Pittsburg. Pa. Filed Nov. 13, 1899.

645,640. Storage Battery Cell. Rufus N. Chamberlain. Depew. N. Y., assignor to Charles A. Gould, Port Chester, N. Y. Filed Aug. 25, 1899.

645,641. Illuminated Sign. George J. Ferguson, Olyphant, Pa. Filed June 5, 1899.

645,641. Regulation of Dynamo-Electric Machines. Charles P. Steinmetz. Schenectady. N. Y., assignor to the General Electric Company of New York. Filed Dec. 15, 1899.

645,785. Holder for Electroplating. William D. McLauchlin, Corunna, Mich. Filed Dec. 15, 1899.

645,785. Holder for Electroplating, William Y. Buck, Bristol. Conn. Filed Sept. 22, 1899.

645,993. Motor-Vehicle Brake. Elmer A. Sperry. Cleveland, Ohio. Original Application filed Sept. 16, 1899. Divided and this application filed Sept. 16, 1899. Divided and this application filed Oct. 30, 1899.

645,997. System of Electrical Transmission. Frederick Bedell, Ithaca, N. Y. Filed July 5, 1899.



# GENERAL NEWS.

What is Going On in the Electrical World.

#### LIGHTING.

Aberdeen, S. D.—The question of municipal owner-ship of the electric light plant will be submitted to the voters at the coming election.

Adel, Is.—The citizens of this place are agitating the

question of erecting an electric light plant.

Alliance, Neb —A. Minnick, of O'Neill, has been given a franchise to erect an electric light plant at Alliance.

Beeville, Tex.—I. N. Hettison contemplates the erection of an electric light plant in this place.

Belleville, Ill.—F. C. Postel, the electrical expert of Chicago, is preparing plans and specifications for an electric light plant for this city. Bids for the construction of the new plant will soon be advertised for.

Bellaire, Mich.—Bellaire has voted to raise \$2,700 to complete its municipal electric light plant which was begun last summer.

Central Covington, Ky. - Sealed bids will be received by W. E. Hockman, the city clerk, up to 5 PM, Wednesday, April 4, for the franchise or privilege of entering in and upon the streets, alleys and highways of this town, to erect and maintain poles, wires and appurtenances for furnishing electricity to consumers for a term of twenty years from the date of the granting of this franchise in accordance with a resolution adopted by the trustees.

Champion, Mich.—Electric lights are assured for the streets of this place in the near future.

Columbus, O.—A resolution is being prepared for the introduction in the city council authorizing an appropriation sufficient to build and equip an electric light plant of ample capacity to light all the public streets of this city. About \$232,000 will be expended.

Emporia, Va.—A bill has passed the Legislature authorizing the city to issue bonds for the construction of an electric light plant. Address W. S. Goodwin.

Granite, Ore.—A franchise has been granted to Portland men for an electric light plant in this new

mining town.

Hanoverton, O.—The citizens of this village are talking of issuing bonds for the erection of an electric light plant.

Hot Springs, S. D.—The Water, Light & Power Company is contemplating putting in new ma electric light plant, to cost about \$25,000.

Huntingburgh, Ind.—Miessner Brothers have been awarded a franchise to erect an electric light plant in this city.

Ilion, N. Y.—At an election held recently it was voted to issue \$30,000 in bonds to build an electric light plant.

Lott, Tex.—The Lott Milling & Electric Light Company, recently incorporated, will erect an electric light plant.

Louisville, Ky.—Bids for an electric power plant for elevators and lighting the Jefferson County courthouse will be received at the office of K. McDonald, architect, until April 1.

Marion, Ind.-B. F. Burk will at once begin the erection of a new electric light plant in this city.

Manitowoo, Wis.—The citizens of this place are in favor of the erection of a municipal electric light plant.

Milbourne, N.C.—This city is to have a new electric light plant.

Nashville, Tenn.—The city council has passed a bill appropriating \$150,000 to erect an electric light plant.

Norfolk, Va.—The Norfolk Electric Light & Power Company has been granted a franchise, and will establish a \$300,000 electric light plant. Address W. D. Pander, vice-president.

Owensboro. Ky.—Plans and specifications are being prepared by F. F. Vater, of Chicago, for the new electric light plant to be erected in this city.

Paulsboro, N. J.—William J. Adamson is about to organize an electric lighting company here.

Peru, Ind.—The city council has accepted the proposition of H. C. Ullen, Jr. and S. V. Perrott, of Indianapolis, for a new electric lighting plant, complete with buildings, to be in operation July 1, 1991.

Pleasantville, N. J.—Plans will soon be s'arted for an electric light plant to be erected here. Mr. Price can be addresse

Sandersville, Ga.—The city council is entertaining a proposition from certain Northern capitalists for the erection of an electric light plant here.

Schulenburg, Tex.—Mr. Anderson is organizing a stock company for the establishment of an electric light plant.

St. Mary's, W. Va.—The St. Mary's Water & Light Company, recently incorporated, will erect an electric light plant and waterworks.

St. Paul, Minn.—The city council has directed that the committee employ an electrician to perfect plans for a city electric lighting system.

Tuscola, Ill.—The Wortham Brothers' Company is thinking of putting in its own electric lighting plant.

#### STREET RAILWAYS.

Battle Creek, Mich.—The common council has granted a franchise to Capt. G. W. Bullis for the Battle Creek-Hastings Electric Railway. All the right of way between the two places is now secured, and work on the construction will begin soon.

construction will begin soon.

Brooklyn, N. Y.—The directors of the Long Island Railroad Company have decided to co-operate with the Atlantic Avenue Improvement Commission in the scheme to do away with steam on Atlantic avenue, in this city, independently of the East River tunnel project, which has been temporarily abandoned. The motive power of the entire line to Jamaica is to be changed from steam to electricity. The estimated cost of the improvement is \$2,510,000, half of which according to the act is to be paid by the city.

Charrefield Me—Erederick Vates Charles Goodwin

Cherryfield, Me.—Frederick Yates, Charles Goodwin and other Biddeford and Saco capitalists have petitioned for a charter to construct an electric line from a point in Cherryfield to a point connecting with the Washington County road, the name of the proposed line to be the Cherryfield & Millbridge road and the distance about six miles. The capital stock is placed at 860,000

Dayton, O.—A franchise has been granted in this city to the Dayton & Troy Electric Railway Company by the county commissioners. Work of construction will begin about June 1.

Elwardsville, Ill.—The Mississippi Valley Traction Company of this place, lately incorporated for \$500,000, will construct an electric railway from East Sz. Louis, Ill., to Edwardsville by way of Collinsville.

Fayetteville, N. C.—J. W. McNeill has received a franchise for building an electric railway and will generate power by water from the Big Rockfish Creek.

Gilmanton Iron Works, N. H.—There is a movement on foot to build an electric road in this town.

Gloversville, N. Y.—The directors of the proposed Mountain Lake electric railroad, extending from here to Mountain Lake, on the top of the Adirondack foothills, have signed a contract with Boston capitalists to build the road which will cost \$150,000.

Hagerstown, Md.—A bill has been introduced into the Maryland Legislature empowering the Hagerstown & Frederick Railway to change its motive power from steam to electricity and to issue bonds to complete the construction of the road.

Harper's Ferry, W. Va .-- The Harper's Ferry Power Company has been organized for the purpose of constructing an electric railroad and will build a power house, etc. Address P. Evans, Philadelphia, Pa.

Houghton, Mich -The Houghton County Railway Company will soon begin the construction of an electric street railway.

Lebanon, N. J.—It is proposed to build a trolley line with an electric lighting plant, from this place to Washington, a distance of 14 miles, passing through Annandale, Clinton, Highbridge, Gien Gardiner and Hampton, to connect with the Phillipsburg line through Washington, Hackettstown and Lake Hopatcong to Newark. It is proposed to extend to Somerville. The power house will be at Clinton.

Nashua, N. H.—Surveyors have been at work upon the route of the Hudson, Pelham and Salem Electric Railroad, which will connect this city with Haverbill,

New York.—The New York, Brooklyn & New Jersey Rapid Transit Company of this city proposes to construct and operate an electric railroad 6 miles long from Manhattan to Brooklyn.

Oakland, Cal.—A. S. MacDonald and W. G. Henshaw of this city have applied to the supervisors of Contra Costa County for a franchise to run an electric line from the town to San Pablo to the Alameda County line, by way of Point Richmond.

Rockville, Md.—Electric railroad enterprises will be an issue in the approaching municipal election here.

Youngstown, O.—The city council has granted a franchise to the Youngstown & Sharon Electric Railway, giving it direct entrance into this city.

### MANUFACTURING.

Buffalo, N. Y.—There is a possibility of the establishment in this city of a factory for the manufacture of electric interlocking switches to be used by steam and trolley reads, which are said to be a vast improvement on switches now in general use.

ment on switches now in general use.

Harrisburg, Pa.—The Pennsylvania Steel Works has fin shed and shipped a duplicate order for frogs for a trolley line in Paris leading to the Exposition grounds. The original shipment, made about six weeks ago, is given up as lost, as the vessel is a month overdue. The road must be completed by May 1, and an effort is being made to have the shipment reach Paris by April 1.

Kansas City, Mo.—The Metropolitan Street Railway Company recently let the contract to the St. Louis Car Comrany for 50 new trolley cars; 25 of these cars are to be delivered in this city June 15, the others are to be here September 1.

Morehead, Ky.-W. J. Rice of this place wants to correspond with manufacturers of dynamos and electric light supplies.

New Haven, Conn.—The Dennison Electrical Engineering Company of this city has begun work on a

large motor omnibus which will be run next summer between Torrington, Litchfield and Bantam Lake.

New York .- The change in the management of the New York.—The change in the management of the Edison, Jr., Light & Power Company has resulted in placing the company on a good business basis, and orders for its batteries are now said to be coming in very satisfactorily. The company manufactures a small battery for light work, such as operating sewing machines, "sparking" engines, running miners' lamps and other invitant process where such as the company manufactures as a state of the company manufactures. machines, "sparking" engines, running miners isamps and other similar purposes where only small power is required.—A company has recently been formed here known as the William S. Chester Co. for the purpose of manufacturing electric and other motors for organs.

Pittsburg, Pa.—The electrical contractors are talking of building a plant in this city for the manufacture of electrical sundries.

Perkasie, Pa —The citizens of this place are considering the erection of a factory for the manufacture of trolley cars.

-The Warren Electric Manufactur-Sandusky, O.-Sandusky, O.—The Warren Electric Manufacturing Company, which recently completed a large order for electrical machinery for Armour & Co., has just booked another big contract with the same firm. The last order is for two large alternating dynamos, the combined weight of which will be nearly 60 tons. Their capacity will be 15,000 lights. The machinery is for the Kausas City plant of the Armours. One of the alternators will be shipped early in June and the other one about a month later.

#### COMPANY MATTERS.

Baltimore, Md.—It is reported that the United Railways & Electric Company, and the United Electric Light & Power Company, which are practically one company, have concluded a deal with the Susquebanna Electric Power Company whereby the last named is to furnish the electricity required to operate the street railway lines, and for lighting purposes in this city.—The Frostburg Gas & Electric Light Company recently filed an application for dissolution.

Hammonton, N. J.—The Hammonton Electric Light Company has sold its electric light plant, including franchise and contracts for lighting the streets, which have six years to run, to the Electric Light & Power Company of this city, a new company recently organ-

Troy, N. Y.—Barnes & Pavton have been awarded the contract for installing a complete electric light plant for the Mahony Manufacturing Company. The concern will use both arc and incandescent lamps.

Washington, D. C.-The Potomac Electric Light & washington, D. C.—The Potomac Electric Light & Power Company has secured permission of the District Commissioners to erect four poles on 37th street between the Canal road and Prospect avenue, and to replace four poles on the Canal road. To these new poles three 500,000 C. M. cables will be attached, and will supply additional power to the Great Falls electric railroad.

Yardley, Pa.—The Yardley Electric Light, Heat & Power Company has purchased the plant at this place belonging to David Peoples, of Philadelphia.

## POWER AND TRANSMISSION PLANTS,

Athens, Ga.—A company in this city, headed by Messrs. A. H. Hodgson, E. R. Hodgson, J. M. Hodgson, J. Y. Carithers and W. T. Bryan, will establish an electric power plant at Tallahassee shoals, eight miles from here on the Occnee River. One hundred thousand dollars will be spent in establishing the new plant, and 1,000 horse power will be developed, which will be rented to different manufacturers in this city.

Buena Vista, Va.—W. A. Joiner and V. O. Brown, of Montezuma, Ga., are investigating with a view to establishing an electric power plant here.

Cripple Creek, Col.—The La Bella power plant was lately reorganized, and it was then decided to double the capacity of the plant.

Holton, Kan -D. K. Rinehard is preparing to build an electric power plant at this place.

Waterville, Me.—An important deal of water power privileges has been consummated by Frank Chase of this city, who has purchased the water power privilege between Great and Long ponds. The purchase means that Mr. Chase is to erect an electric lighting and water power station there with which he will supply the town of Belgrade Mills both with water and lights.

#### AUTOMOBILES.

Newark, N. J.—It is claimed that the Automobile Company of America, incorporated in this city last week, with a capital stock of \$250,000, is part of the scheme to combine all the Western automobile manufactories. The incorporators are: George A. Lamb, Edward B. Hawkins and Alfred G. Brown.

Newport, R. I.—The New England Electrical Vehicle Transportation Company of Boston has purchased from Mr. Albert H. Hayward the so-called stable property on State and D. wning streets, which it will use for an automobile depot, and be complete in every detail. The company intends having about 100 automobiles here this summer.



# THE TELEPHONE WORLD.

#### Strong Company in Each State.

According to a daily paper, among the important plans which the Telephone, Telegraph & Cable Company of America has under way are the making of close arrangements with Western telephone companies for the purpose of establishing a through line to the Pacific coast. When this arrangement is perfected the independent telephone company will be in a position to cut into the long distance business of the Bell Company and greatly injure its revenue.

Among the Western lines with which negotiations are said to be pending are the San Francisco lines and those in Oregon and Washington, the Rocky Mountain system, which branches out in various directions from Denver and various systems between Denver and the coast. The Southern States are also being canvassed, and it is expected that arrangements will be made for co-operating with the Southern Bell Telephone Company, which includes Atlanta and traverses several Southern States.

Steps are also being taken to get control of the Cincinnati & Suburban Telephone Company, which is one of the most important of the intermediate systems, and the proposed long distance service of the Telephone, Telegraph & Cable Company includes the Washington City lines and the Miami Valley & Ohio lines.

The policy of the new movement will be to have a strong company in each State. These companies in turn will furnish the funds with which to buy competing companies of the Bell Company.

#### Increase of Bell Telephone Stock.

At a special meeting of the stockholders of the Bell Telephone Company at Philadelphia on the 20th inst. it was voted to increase the capital stock of the company from \$4,000,000 to \$6,000,000. The new stock may be subscribed for at par, \$50, until April 20, payments to be made May 20, July 20 and September 20.

Referring to the consolidation of the American Bell Telephone Company with the American Telephone & Telegraph Company, President John E. Hudson of the Bell Company is reported as saying that the present change is the logical result of the great development of the long-distance telephone system. The American Telephone & Telegraph Company, which was organized to build the long-distance lines, became the owner of the capital stock of many of the licensees of the American Bell Telephone Company. These holdings increased so that it was thought best to put both concerns under one control. Existing statutes made it necessary that this control should be vested in the long-distance company.

The Union and Independent long distance telephone companies of Kansas and Missouri, with 300 miles of lines in the two States, have just been consolidated under the name of the Kansas Telephone Company with a capital of \$200,000. The company has connections with the other independent long distance companies of Kansas and Missouri, to compete with the Bell Company. All these long distance companies want an independent company to get a franchise in Kansas City, in order to give them connections with St. Louis and Chicago by way of that city.

By a recent agreement between the Bell Telephone Company and the Diamond State Telephone Company of Dover, Del., the present line of long-distance telephone from Dover to Wilmington and from Elkton, Md., to Wilmington, were turned over to the Diamond State Telephone Company. By this traffic agreement the Diamond State Telephone Company's subscribers will be able to reach the entire system covered by the Bell Telephone Company throughout the United States.

At a meeting of the stockholders of the Marietta Telephone Company, Marietta, (i.a., recently, called for the purpose of discussing their future prospects, after a thorough examination of the company's affairs it was decided to discontinue business and dispose of the property on the best terms obtainable, it having been determined that the receipts would not run the business.

A bill was passed in the House of Representatives on March 19 incorporating a telephone company to compete with the Bell Company in the District of Columbia, which promises to furnish service to business houses for \$48 a year and to private residences for \$36.

The Bell Telephone Company, which put telephones in Shelbyville, Ind., some time ago free of charge in order to crush the existing company, now announces prices the same as the local company's after April 1.

The Anthracite Telephone Company, which is now erecting lines in New York State, will apply to Governor Stone of Pennsylvania for a charter of incorporation to erect and maintain wires in Susquehanna and Lackawanna counties.

#### An Independent Company in Texas.

The independent telephone project in Texas has assumed definite shape, the charter of the Lone Star Telephone Company with a capital stock of \$500,000 having been filed in the office of the Secretary of State at Austin. One-tenth of the stock has been paid.

The purpose of the company, as stated in the charter, is to construct, acquire, maintain and operate telephone and telegraph lines in Texas. The business of the corporation will be transacted in Galveston, Houston, Austin, San Antonio, Laredo, El Paso, Fort Worth, Whitesboro, Denison, Paris, Texarkana, Longview and Dallas. The principal office will be in Austin.

The incorporators are: J. B. Earle and J. E. Boynton, of Waco: H. M. Aubrey and F. C. Smith, of San Antonio; W. H. Eager. James J. Brailey, of Wauseon, O.; J. M. Longnecker, Delta, O.; W. H. Harper, Jr., John P. Bailey, Ottawa, O.; Jafes King Duffy, New York City; W. A. Armstrong, Doniphan, O.

In addition to establishing exchanges in each of the cities above named, it is purposed to connect them with long-distance lines. The Bell interests, which operate in Texas under the name of the Southwestern Telephone & Telegraph Company, are alarmed at the financial strength of this new rival.

#### Cheap Telephone Service in Charleston.

Recent developments in the telephone situation at Charleston, S. C., says the N. Y. "Commercial," have broken the long monopoly which was held by the Bell Company. Two years ago a new company, the Carolina Mutual, invaded the field, prepared to put in a first-class service.

From the time the magnates came on to purchase property however, the Bell people started their fight and carried this to the city council, with almost disastrous effect to the Carolina Mythal

There were several things which helped the Bell Company in its council fight, but the slick work and scheming was uncovered and the popular cry raised gave the Carolina Mutual Company the rights and franchise it had desired.

The Mutual Company did not come up to expectations after a trial, however, and a year ago the plant was sold to an English syndicate. As the Gordon Telephone Company the concern has given the Bell Company the strongest opposition it has ever had.

The home phones, put in at \$24 per annum, and the office phones at not much more, were too much for the Bell and the Gordon subscription list is as large as the Bell.

The public has received all the benefits, for the two systems have been made next to perfect.

The Bell Company has very largely increased its list of subscribers by putting in 'phones where five cents only is charged for each call message.

charged for each call message.

This 5 cent rate makes the service limited, and requires at least \$2 per month to insure the putting in of a 'phone, while the other company, reaching the same subscribers, and with a service equally as good, gives an unlimited service at the same rates.

The Gordon Company has taken scores of subscribers from the Bell, has divided the honors with that company in that it places two 'phones in every business house and residence, and has gathered many subscribers who never used a 'phone under the high rates of the Bell Company.

Two independent telephone companies are seeking franchises to operate telephone systems in Kansas City, Mo. One known as the Parker Company agrees to complete the work of installation within one year from date of agreement. The rates named are \$2 per month for business houses and \$1 for residences. Three 'phones are to be furnished without charge to the city. The second applicant designated as the Montague Company, asks a thirty year franchise, with the following rates: Residences, single line, \$1.50; party line, \$1; business houses, single line, \$2.50; party line, \$2. The company offers to furnish five 'phones free for the use of the city and to put in a free fire alarm service of ten stations, the location of said stations to be designated by the council. This company agrees to use the Ericsson system, which is looked upon favorably by the council committee.

At a recent meeting of the aldermen of Brockton, Mass, a franchise was granted to the Massachusetts Telephone Company, with several iroxclad conditions, among which is one that the company shall pay to the city annually after the first year of operation 2 per cent. of its gross earnings. In constructing conduits, the company must employ Brockton laborers at \$2 per day. It must file a bond of \$10,000 to comply with the conditions of the franchise and deposit a certified check of \$3,000 as a guarantee to have the exchange in operation in fifteen months.

#### To Unite Under One Name.

Cleveland officials of the Bell Telephone Company state that the consolidation of the Bell Company with the American Telephone & Telegraph Company, reported in last week's Electricity from Boston, is only the working of a wheel within a wheel.

They say that the American Telephone & Telegraph Company is the first long distance telephone company and that it was organized and is now under the control of the Bell management.

The reasons given for the proposed transfer of the Bell stock over to the American Company is that the Bell Company desires to change the name of its entire system to the American Telephone & Telegraph Company. As the latter company is organized under the laws of New York, and the Bell under the laws of Massachusetts, by changing the name of the whole system to the American Telephone & Telegraph Company both companies will come under the laws of New York, which the officials believe are more favorable for the enlargement of their business.

It is said that the change will in no way affect the independent telephone companies throughout the country.

# Decision in Favor of Telephone Companies.

A dispetch from Lansing. Mich., states that the question of the right of telephone, telegraph and electric railway companies to trim trees along the highways traversed by their poles and wires, has long been a disputed one in Michigan, and as these several industries were extended the controversies over this matter became more frequent. Finally the question found its way into the courts, and the highest tribunal decided that the companies could trim trees interfering with their wires in a unanimous opinion handed down in the case of Oscar Wyant vs. the Central Telephone Company.

The case came from Berrien County, where Wyant commenced action against the company before a justice of the peace, the declaration charging trespass in cutting and trimming of trees on his premises, and in the highway adjacent thereto. The record disclosed the fact that the company's employes trimmed some trees so that the wires would not come in contact with the branches and thereby become grounded and broken. This was done in a reasonable manner, no more cutting or trimming being done than was necessary.

In the court below it was held as a conclusion of law that while the company might place poles in the highway without proceedings for condemnation, it had no right to cut, injure or mutilate trees without compensation to the owner for any special damage occasioned thereby. It was this ruling which sustained Wyant's main contention that the Supreme Court was called upon to review.

In disposing of the case the higher court says that the right being given to erect poles and wires, the company must of necessity have the right to remove obstructions. The court takes judicial notice of the fact that the poles must be set near the sides of the street or road, and that they are generally outside of the curb or ditch line, and, therefore, necessarily in line with the trees. Unless they are to be so high as to clear all of them the wires must necessarily go through the trees.

It was also claimed that the telephone company had no right to cut the branches without first giving the land-owner an opportunity to do so himself. but the court says that the present case does not come within the statute relied upon for the reason that this statute refers only to the cutting down or removal of shrubs and trees and not to the trimming of trees.

The New Telephone Company of Indianapolis, Ind., has filed with the county recorder an \$800,000 mortgage on its property, franchises and privileges, canceling the \$500,000 mortgage made at the time the company began operations. The additional \$300,000 will be used in making improvements. President Nordyke is reported as saying that an extension of the plant had become necessary. Instead of preparing for 2,500 'phones arrangements for installing 4,000 instruments will be made.

The Springfield, Mass., board of aldermen has voted to give the Hampden Automatic Telephone Company an opportunity to compete with the existing local telephone company. The only object in granting the privilege is to force the established company to give more liberal rates for the use of its telephones, says the Hartford "Times."

### TELEPHONE INCORPORATIONS.

The Tri-County Telephone Company, Tamaroa, Ill. Capital stock, \$2,500. Incorporators: G. Blanchard, J. D. Morris, A. J. Fitzgerrell, all of Tamaroa.

The Germantown Independent Telephone Company, Germantown, O. Capital stock, \$25,000. Incorporators: John C. Schaeffer, Arthur T. Glew, Harrison Walpers, Henry Kemp and Charles W. Hildabolt.



# ECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; extension; gcn., gcneral; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

# STOCKS.

Albany, N Y Mar 26.  United Traction	Onn.—Mar 26: Ry. Oo	x Authorz's 00 \$4,000,00 00 \$1,000,00 00 \$600,00 00 \$5,000,00 00 \$1,000,00 00 \$2,500,00	200 \$200,000 247,000 00 400,000 00 1,000,000 00 5,000,000 9,900,000 87,500 00 2,500,000 00 15,010,000 00 17,712,200 00 4,000,000	0 11/4 %., April '98, 02/4 % 8., Oct., '98, 01/4 %, Oct., '98,	2073x 150 2073x 150 24	28 
Albany, N Y Mar 26.  United Traction	## A Property of the Control of the	00 84,000,00 00 1,000,00 25 1,250,00 5,000,00 00 10,000,00 2,500,00 00 2,500,00 00 17,000,00 8,000,00	200 \$200,000 247,000 00 400,000 00 1,000,000 00 5,000,000 9,900,000 87,500 00 2,500,000 00 15,010,000 00 17,712,200 00 4,000,000	0 8 % A., June, '98. 0 8 % A., June, '98. 0 8 % A., June, '98. 0 1 1/2 % A. April '98. 0 1 1/2 % S., Oct., '98.	150 	212 - 28 - 69 111
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Bridgeport, Conn—Mar 26: 3.000,000 2,000,000 1 % Aug., '98 105   Indianapolis	Is, Ind—Mar 26.	5,000,00 00 10,000,00 	5,000,000 9,900,000 87,500 00 8,500,000 2,500,000 15,010,000 1,712,200 4,000,000	0	8. 110 683%	69 111 4 68
Saltimore   Md Mar   26   United Rail ways & Elec. Oocom.   50   24,000,000   13,000,000   16   24   16   16   16   16   16   16   16   1	Pa.—Mar 26  Praction Oo. 10  Cal. Electric By  Example 10  S. Minn.—Mar 26  d Transit	00 4,000,00 00 2,500,00 00 17,000,00 00 8,000,00	9,900,000 87,500 00 8,500,000 2,500,000 15,010,000 1,712,200 00 4,000,000	0 11/4 %., April '98, 02/4 % 8., Oct., '98, 01/4 %, Oct., '98,	6834 110	69 111 4 68
1634   1634	Content   Cont	00 4,000,00 00 2,500,00 00 17,000,00 8,000,00	87,500 00 8,500,000 2,500,000 00 15,010.000 1,712,200 00 4,000,000	0 114 %., April '98, 02%, % 8., Oct. 1, '9	68 % 110 63%	111 4 68
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North Chicago City RR	&E. Rivers RR. guar 10	00 1,800,00 00 1,000,00	00 1,800,000 00 1,000,000	0 2 <b>¼ % Q.</b>	195 895	400
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Onty Railway Co	est End Ry 5	DU 1,000,00	0 1,500,000 0 17,000 000	յս 76 ա., սա ա ա ա, ա	8	18

- Unlisted. † Full paid. † Outstanding. † Ex-div.
  a Leased to New Orleans Traction Company at 6 % on stock.
  b Leased to New Orleans Traction Company at 8 % on stock.
  c Leased to New Orleans Traction Company at 8 % on stock and interest en bonds.
  d Operating the former Met. Trac. system, that corporation having become extinct.
  e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
  f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Ry.
  f Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
  h Leased to Metropolitan Street Ry. for 99 years from Jani 1, 1895, at \$215,000 per annum.
  i Leased to Metropolitan Street Railway for 18 % on stock
  j Leased to Metropolitan Street Railway for 18 % on capital stock.
  l Leased to Metropolitan Street Railway for \$145,000 per annum.
  l Leased to Metropolitan Street Railway for 18 % on capital stock.
  n Dividends of 13 % vearly guaranteed by Consolidated Traction Company.
  o Controlled by Third Avenue Railroad by purchase.
  n Dividends of 13 % vearly guaranteed by Consolidated Traction Company.
  o Controls by lease the Alleg'ny, Cent., Oitizens' Duquesne, Fort Pitt & Pitt'h Traction.
  p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
  q Leased to Consolidated Traction Company for 8 % on capital stock.
  s Leased to Consolidated Traction Company for 7 % on capital stock.
  s Leased to Consolidated Traction Company for 7 % on capital stock.

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PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

PAGGE			TAILN				IELEPHONE						
		Capital		Bate and Date of					Capital		Eate and Bate of		
NAME.	Par	Authors'd	Issued.	Last Div.	E3d.	Asked.	NAME.	Par	Authors'd	Issued.	Last Div.	BM.	1404
New Bedford Mass-Mar 26	1,,,	\$850,000	8980 000	2 %, Feb. 98.	160	165	Boston, MassMar 26.	1,00	50 000 000	OF 050 000	424 X Q . To - 199	915	
Northampton, Mass-Mar		\$200,000	<b>4680,000</b>	2 76, Peb. 20.	100	100	American Beli Telephone Co Erie Telegraph & Telephone Co New England Telephone Co	100	10,894,600	10,804,600	4% % Q., Jan., '99. 1 % Q., Feb. 20, '99 \$1.50 p. sh. Feb '99.	1015	815% 105
Northampton Street Rv.	100	900,000	225,000	4 % A., June '98.	179	178	New YorkMar 26:		1		l		
Omaha, Neb Mar 26; Omaha Street Ry	100	5,000,000	5,000,000	8 % A. and N.	55	65	American Telegraph & Cable Co *Central & South Am. Teleg. Co	100 100	14,000,000 6,500,000	14,000,000 6,500,000	1×× 8.	98 107	96 109
Paterson Rv. Co	100	1.950.000	1,250,000		54		*Commercial Cable Co2½% guar.  Franklin Teleg. Co2½% guar.  Erie Telegraph & Telephone Co	100	1,000,000	10,000,000	12 X Q.	165	170 50
Providence, R. IMar 26							*Gold & Stock Telg. Coguar. 6 %. *International Ocean Tel Co.guar 6%	100	5,000,000 8,000,000	*******	1;	112 118 116	118 123 11s
United Traction & Electric Co Philadelphia.—Mar 26	100	8,000.000	8,000,000	3/4 %, Oct. '98	109	112	Mexican Telephone Co*New York & New Jersey Tel. Co	100 100	2,000,000 5,000,000	8,728,000	2½ % Q., Jan., '99.	95	175
Fairmount Park Trans. Co\$50 pd.	50 50	2,000,000 1,966,100	1,770,000 11,966,100	2 %, Dec. '97. 2% %, July 15, '98.	28 47	24 48	*Pacific & Atlantic Telegguar. 4 % *Postal Telegraph Cable Co *Sout'n & Atlantic Telg. Co.guar. 5 %	25 100 25	2,000,000 15,000,000	15,000,000	2	95	100
Hest'nvl'e, Man. & Fairm's % pid. aFairmount Pk. & Had. Pass. Ry.	50	800.000	800.000	2% %, July 15, '98, 8 % S—July, '98, 8 % Feb. I, '98.	75 75	76 76	Commercial Union Telegraph Co	25	500,000	500,000 97.870,000	8 % S., Jan., '99. 1% %, Q, Jan. '99.	115 881/4	
Union Traction Co	50 50 50	500,000	29,980,450 8,297,920 +192,500	58 share Q.	835 845	85% 	†Div. guar. by Postal Teleg. Co. Miscellaneous.—Mar 26:						
Frankford & Southwark Pas. R			11,875,000	\$14 sha'e A-Apr.98	45 J 48	451	American Dist. Teleg. (Phila.) Bell Teleph. Co. (of Canada.)	26 100	400,000 8,960,000	8,561,000	1 % Q. 2 % S.	21 188	24
Lombard & South Street Ry	25 50	1,060,000	†771,076°	A. & O. 89 share A, Mar. 98	90 300	90%	Chesapeake & Potomac Telep. Co Chicago Telephone Co	100 100	•••••	*****	****	65 200	70 210
ePeople's Traction Co	50 50 50	1,500,000	1572,800		144 151	145 152	Central Dist Prig & Telg.Co.(Pgh.). Empire & Bay States Telegraph Co.		750,000	750,000	• • • •	148	150 76
hPeople's Passenger Rycom hPeople's Passenger Rypfd.	25	1,500,000 750,000	740,000 277,402			·	Hudson River Telephone Co *Northwestern Telegraph Coguar Providence (R. I.) Teleph. Co	100 50 50	2,000,000 2,500,000		232 X Q.	117 117 94%	120 96
(Philadelphia Traction Co	50		1400,000	82 p. sn., Oct. 98.	95	96½ 157	Southern New Eng. Teleph. Co	100	8,000,000		• • • • • • • • • • • • • • • • • • • •		
Ontinental Pass. Ryguar  †Empire Passenger Ry. Co  Philadelphia City Pass. Ry	50 50 50	600,000	600,000 475,000	\$6 share—July, '98. \$7.50 share July '98	202	208	ELECTRIC LIGHT	1///	O ELE	EOTRI	OAL MFG.	. 0	<del>1</del> <del>1</del> <del>1</del> <del>1</del> <del>1</del> <del>1</del> <del>1</del> <del>1</del> <del>1</del> <del>1</del>
Philadelphia & Gray's Fy. RR Ridge Avenue Passenger Ry	50 50		298,650	\$8,50 share July '98.	8.834		Boston, Mass.—Mar 26: Fort Wayne Electric trust receipts				••••		125
Philip delphia & Darby Ry.guar.	50 50	1 000 000	200,000 250,000	82 share July, '98.	800	••	Ft. Wayne Elec Co. T. Sec. Series A. tGeneral Electric Co. [old] com.	26 100 100	40,000,000	80,460,000	2 % Q., Aug., 1898. 1% % Q., Jan., 1900	85	1801 <u>4</u>
Thirteenth a 15th Sts. Pass. Ry. Union Passenger Ry. Co	50		1900,000	811 sh. A., July, '98' 89.50 shre, July '98' 810 share, July '98'	289	240	†General Electric Co. [old] com. General Electric Co. [new] " TH. Elec. Co T. Secur., Series D. Westinghouse Elec. & Mfg.Co.com.	50	18,270,000	146,700		2>6 48	
Rochester, N. YMar 26			1.00,000				Westinghouse El. & Mig. Co. pfd. Westinghouse El. & Mig. Co. assent.	50 50	4,000,000 11,000,000	8,996,058	1% % Q., Jan., '99.	61 42	62
Reading. Pa.—Mar 26	100	5,000,000	5,000,000	*****	17人	20	New York.—Mar 26: Edison Elec. Ill'g Co., New York	100	9,188,000	7,988,000		119	120
j Heading Traction Co		1,000,000	1,000,000	Semi-an.,Jan. & Jy	24 183	26 	*Edison Elec. Ill'g Co., Brooklyn Edison Ore Milling Co	100 100	4,000,000	2,000,000	13/ % Oct., 198.	8	iż
iEast Reading Electric Ry	50	1,000,000	850,000 \$1,000,000	Jan., 198.	70	•••	Electric Vehicle Oocom.	100	40,000,000	80,460,000	2 % Q., Aug., 1998. 1½ % Q., Jan., 1900.	82	94
St. Louis MoMar 26 Fourth Street & Arsenal Ry	50		150,000	2 % Dec., 1888.	••	••	Interior Conduit & Insulation Co  Kings Co. El. L. & P. Co	100 100 100	1,000,000	1,000,000 2,500,000		41	1803
Jefferson Avenue Ry. Co Lindell Ry Rational Railway Co	100		400,000 2,400,000 2,470,000	2 % Dec., 1888. 1½ % Jan., '99. 1½ % Jan. '99.	:	••	Pittsburg, Pa.—Mar 26					-40	
Cass Avenue & Fair Grounds	100	2,500,000	2,500,000 1,500,000	4 %, Oct., '98.	:	••	Allegheny County Light Co East End Electric Light Co	100 50	<b>500,000</b>	500,000 800,000	J. & J. Q	166	172
St. Louis RR	100 50	2,400,000	2,000,000 2,300,000	4 %, Oct., '98. 2½ %, Jan., '99. 1½ % Jan., '99.	••	::	Philadelphia, Pa.—Mar 26 Edison Electric Light Co	100	2,000,000			144	14456
United Electric Ry	50	500,000	500,000	50c., Dec., '89. 8 %, Jan., '99.	25 71	80 80	*Electric Storage Battery Coom. *Electric Storage Battery Copfd.	100 100	8,500,000 5,000,000		******	98 96	981% 97
Di. Louis & Suburban Ry Union Depot RB	100	2,500,000	2,500,000	8 % A., July, '95.	68	50	Northern Elec. Light & Power Co Southern Elec. Light & Power Co	10 10	550,000 187,500	550,000 187,500	••••	30	10%
San Francisco, CalMar.	100	1,000,000			117	119	Miscellaneous.—Mar 26: Bridgeport (Conn.) Elec. Lt. Co	26	500,000		*****	47	43
California St. Cable RR	100	1,000,000	875,000	50c. monthly. \$2.50 share, '96. Q., 60c. per share.	80 61½	683	Missouri-Edison (St. Louis)com. Eddy Electric Mfg. Oo Hartford (Conn.) Elec. Light Oo Hartford (Conn.) Lt. & Power Co	25			••••	25 10	28 14
Presidio & Ferries RR	100	1,000,000	550,000	***************************************	••	16	Hartford (Conn.) Lt. & Power Co New Haven (Conn.) Elec. Lt. Co	100 25 100	850,000 175,000 100,000	•••••	•	156 6 195	160 10
Scranton Pa - Mar 26 Beranton Railway Co	50 100	6,000,000 500,000	2,500,000 500,000	*******************************	29 16	80	New Haven (Oonn.) Elec. Lt. Co Narragansett (Prov., R.I.) Elec. Co. Bhode Island Elec. Protec. Co	50 100	1,200,000		2 % Q., Oct., '98.	98 118년	
m Scranton & Carbondale Trac. Co m Scranton & Pitiston Traction Co	100		1,050,000	*******************************	••	••	Royal Elec. Co. (Montreal)	100 100	1,000,000 1,085,000	1,085,000		158 1 <b>83</b> %	194 1843
Springfield III.—Mar 26: Springfield Consolidated By	100	750,000	750,000	***************************************		••	Woonsocket (R. I.) Electric Co	100	the steel	•••••	J.		100 106
Springfield O.—Mar 26 Springfield Street By	100	1,000,000	1,000,000	*******************************		11	to \$20,827,200, of which \$18,276,000 is c Recently acquired the Edison Illi	omn umir	on and 🗱	,551,200 pr	eferred.	i Ex	div.
Springfield, MassMar 26							pany, the Municipal Electric Light	Co.					
pringfield Street Ry Toponto Canada.—Mar 26	100	1,200,000	1,166,700	8 % A.	207	212			TO CE	JIRIE	· ·	-	
Toronto Street Ry  Montreal Street Bailway Co	100	6,000,000 <b>4,000,</b> 000	6,000,000 4,000,000		100 2995	1083/8 300	Boston Mass.—Mar 26; Delaware Gas Light Cocom.	50 50	500,000	500,000 200,000	J. & J. J. & J.	73% 98	••
Washington, D. CMar 26:							Delaware Gas Light Copref. American Electric Heating Co Street Rv. & Illu'g Propertiespfd		10,000,000	*********	J. & J.  2 p. sh. Jan. 26, '99	:	-
Eelt Ry. Co	50 100 50	500,000 \$12,000,000 400,000	12,000,000 400,000	65c. per sb, Oct. 97.	103	107	Street Ry. & Illu'g Propertiespfd United Electric Securities Copfd. New York.—Mar 26:	100	••••	1,000,000	8.50 p sh. Nov'98.	•	100
Lckington & Soldiers' Home Ry Georgetown & Tenallytown Ry	50 50	707,000 200,000	652,000 200,000		<b>8</b> 5 15	40 16	Consolidated Electric Storage Co	100	• • • • •		••••	8	12
wetropolitan RR. Co	50	1,000,000	458,900	2⅓ % Q.	••	••	Worthington Pump Copfd	100 100 100	5,500,000 2,000,000	5,500,000 2,000,000			156 110
*Worcester Traction Co6 % pfd.	100 100		8,000,000 2,000,000		25 105	28 106	Philadelphia PaMar 26			2,000,000	7.7.		
Worcester & Suburban Street Ry Wilkesbappe, Pa.—Mar 26	100		542,500	4% %, 1897.		85	Electro Pneumatic Trans. Co United Gas Improvement Coscrip. Welsbach Commercial Cocom.		1,500,000			1	162
Wilkesbarre & Wvoming Val. Trac	100	5,000,000	5,000,000	1%, Jan., '97.	25	29	Welsbach Commercial Copfd. Welsbach Light Co	100 100 5	8,500,000 500,000 <b>525</b> ,100		XQ	52 2 40	5 % 55 41
* Unlisted. † Paid in. † Full a Leased to Hestonville, Man &	ιFai	rmount Pa	ssenger R	y, for 6 % on stock	per a	nnum.	Welsbach Light Co., Canada	5	500,000			134	
b Consolidation Electric, Pec charges and all indebtedness of	ple's	and Ph	iladelphia	Traction compani	ies.	Fixed	Pittsburg, Pa.—Mar 26; Oarborundum Mfg. Co	100 100	200,000 1,000,000	200,000 1,000,000		76	180
c Practically all shares owned d Lease to Frankford & South	78FK	Passenger	tion Comp	any. ned by Electric Tr	actio	n Co	MiscellaneousMar 26;		1,500,000		,		
f Controlled by Frankford & S	omp outh	any. wark Pass	enger Rai	lway.	J. 0101		Barney & Smith Car Cocom, Barney & Smith Car Copfd.	100 100		1,000,000 2,500,000	2 %	IC4	18 106
g Lessed to People's Passenger h Majority of stock owned by I	Rail Peop	lway at \$5 le's Tracti	per share.				Billings & Spencer Co	25 100 100	1,250,000		% % Feb. '98		60 LOS
i Leased to Union Traction Oor j Lease transferred to Union Tr jj Leased to United Traction O	raction p	on Compai	ental of	310,000 per annum	jn 1	866-7-8	Pratt & Whitney Copfd	100	•••••	******		4	8 52
p.s. \$20,000 in 1839-1900 and \$30,000 declared as a dividend semi-annua	per lly.	annum th	eresiter, p	payable semi-annu	ally,	ren <b>ta</b> l	Stillwell-Bierce Coom. Stillwell-Bierce Co		•••••	2	% Seint 1 '98.	50 l	50 65
k Dividend of 10 % guaranteed Dividend of 6 % guaranteed t Legged and operated by the 8	y R	eading Tra	etion Con	npan▼.	ماهموم	n Cla	Shuits Belting Co	100	500,000	******	****	90 90	90 90
Leased and operated by the S	~ # # II	THE DELLW	<b>=,</b> , 10.	imatri primuion Ti	<b>a</b> 0110	ш ОО,	Attituer	1	- 1	•	T	1	

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# BONDS.

PASSEN	JER R	AILWA	Y.				PASSEN	AY.	470	1			
	Amou			Interest				Amo			Leterest		
NAME.	Authorized.	Issued.	Due	periods.	Bid.	Asked.	NAME.	Anthorized.	Issued.	Due	periods.	Bid.	Astro
Albany N. Y.  Date of Quotation—Mar 26, 1900  The Albany Ry. Co Cons. mig. 5s. iWatervleit Turnpike & RR.1st mig. 6s. iWatervleit Turnpike & RR.2d mig. 6s. Troy City Railway Co	\$500,000 750,000 850,000 150,000	850,000	1947	M. & N. M. & N. M. & N.	*125	127½ 127 127	New Orleans La.  Dote of Quotation—Mar 26, 1900.  Canal & Clatborne RR cons mig. 6s.  Orescent City RR	850,000 800,000 800,000	50,000 8,000,000 899,000 2,599,500 850,000 800,000	1899 1948 1908 1948 1907 1912	J. & D.	1051/4 108 112	112 118
Baltimore Md.  Date of Quotation—Mar 26, 1900  United Electric Ry. Colst mtg. g. 4s  """""""""""""""""""""""""""""""""""	88,000,000 14,000,000 2,000,000 1,500,000 1,250,000 750,000 96,000 96,000 8,000,000 1,000,000	1,250,000 1,750,000 117,000	1949 1911 1929 1901 1942 1900 1906 1912 1982	J. & D. M. & N. M. & N. M. & S. J. & D. J. & J. N. & M. J. & J. M. & N. J. & D.	102 74% 1187% 119 104% 121 101 1023%  119 114 117	102½ 75 120 121½  121 117	New York  Date of Quotation—Mar 26 1900.  Atlantic Ave. (Brooklyn)Imp. g. 5s. Atlantic Av. (Brooklyn)lst gen. mtg. 5s. Atlantic Av. (Brooklyn)lst gen. mtg. 5s. IBro'dway & 7th Ave	759,000 8,000,000 12,500,000 1,500,000 1,125,000 1,000,000 6,000,000 2,000,000 1,000,000 250,000	1,966.000 7,650,000 1,500,000 500,000 1,125,000 1,000,000 6,000,000 2,000,000 448,000	1909 1981 1948 1904 1914 1924 1905 1941 1989 1988 1941 1941	M. & S. A. & O. J. & D. J. & D. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J.	95 1073/4 115 128 104 108 115 105 116 115 101 104 112 107	110 116 125 105) 110 117 106 117
## All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.  BOSTON, MASS.  Date of Quotation—Mar 26, 1900. †Lynn & Boston RRlst mig. g. bs. West End Street RyDeben. g. 5s. West End Street RyDeben. g. 4%s. †\$1,674.000 in escrow to retire outstanding bonds of absorbed companies.  Charleston S. C.  Bate of Quotation—Mar 25, 1000 †Enterprise Street RRlst mig. 5s. †Onarleston City Rylst mig. 5s. †Onarleston City Rylst mig. 5s.	5,879,000 8,000,000 2,000,000 500,000 850,000	8,702,000 8,000,000 2,000,000	1902	J. & D. M. & N. M. & S. J. & J. J. & J.	114 1043/ 112	115 106	Bleecker St. & Full'in Fer'y RR. Ist mtg. 7s. Cent P'k, N. & E. R. RR. Ist cons. mtg. 7s. Central Crosstown RR	7,00,000 1,200,000 1,200,000 250,000 800,000 1,000,000 100,000 000 000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000	5,181,000 700,000 1,200,000 250,000 800,000 980,000 1,100,000 1,200,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000	1945 1900 1902 1922 1908 1982 1914 1914 1915 1995 1997 1909 1922 1919 1989 1999	J. & D. M. & N. J. & J. J. & D. F. & A. M. & S. J. & J. M. & S. F. & A. M. & N. J. & J. J. & J. J. & J. J. & J. J. & J.	109½ 101½ 101½ 125 101 117 102 108 116½ 89 124 120 120 128 116 110½	108 109 108 120 106 117 125 121 109 117 1123 1283
Chicago III.  Date of Quotation—Mar 26, 1900 Ohicago Oity Ry	6,000,000 400,000 1,000,000 7,500,000 1,500,000 4,040,000 7,574,000 500,000 500,000 2,500,000 4,100,000 2,700,000 12,500,000 12,500,000	500,000 7,500,000 750,000 4,040,000 8,781,200 15,000,000 8,171,000 500,000 2,500,000 8,969,000	1908 1929 1907 1982 1928 1942 1906 1911 1900 1927 1928 1911	F. & A. J. & D. A. & O. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J.	1013/4  1081/6 96 106  108	23/4 102 109 96/6 111 102 107	Union (Huckleberry) Rylst mtg. 5s.  11 Westchester Electric RRlst mtg. 5s.  131,035,000 in escrow to retire gen. mtg. bonds.  134,850,000 in escrow to retire maturing obligations.  18552,000 in escrow to retire lst and 2d mtg. bonds.  2In treasury, \$80,000.  11 Guar. by Union By. Co.  TOPONTO Canada.  Date of Quotation—Mar 26, 1900.  Montreal St. Rylst mtg. 2s.  1385,000 per m. single track authorized. \$600,000 in escrow to retire 5s due in 1901.  Philadelphia.	2,500,000	\$00,000 \$00,000 \$00,000 2,200,000	1948	J. & J.	118	116
†Redeemable at option on 60 da. notice. †Funded debt assumed by Ohicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.  ¶Subject to call after Oct. 1, 1899, at \$110 and interest.    Assumed by W. Chi. RR. Co., lessee.  †Int. guar. by W. Chi. RR. Co., lessee.  †Int. guar. by W. Chi. RR. Co., lessee.  †Int. guar. by W. Chi. RR. Co., lessee.  †Int. guar. by W. Chi. RR. Co., lessee.  †Mt. Adams & Eden P'k In 1st mtg. 6s. †Mt. Adams & Eden P'k In 1st mtg. 6s. †Mt. Adams & Eden P'k In 1st mtg. 6s.  §So. Cov. & Cin. St. Ry 1st mtg. 6s. †Assumed by the Cincin. St. Ry. Co., †250,000 reserved to retire leis mtg. bds.	8,000,000	100,000 581,000 250,000	1900 1905 1906 1912	J. & J. A. & O. A. & O. M. & S. M. & S. J. & J.	118 % 108 % 114 108 % 121 % 182 %	1143% 104  1223% 187	Date of Quotation.—Mar 26.1500 Continential Pass. By	800,000 100,000 150,000 250,000 5,098,210 5,698,210 100,000 1,800,000 100,000 29,785,000 250,000 750,000	810,000 200,000 100,000 250,000 458,000 867,000 1,018,000 100,000 500,000 29,724,876 246,000 750,000	1898 1901 1905 1911 1912 1948 1910 1917 1908 1911 1945 1906	J. & J. J. & J. M. & S. J. & A. & O. A. & O. A. & O.		
Cleveland, O.  Date of Quotation—Mar 26, 1900.  aBrooklyn Street RR. Coist mtg. 6s. Cin. New't & Oov. St. Ry Cons. mtg. 5s. Cleveland City Cable Rylst mtg. 5s. tOleveland Electric Ry.Co. 1st mtg. g. 5s. Columbus (O.) Cent. Bylst mtg. 5s. aBast Cleveland RRlst mtg. 5s. Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s. [5t. Ry. Co., Grand Rapidslst mtg. 5s. †41,900,000 in escrow to retire bc n'ls of absorbed companies, marked a. †Interest guar. by Cons. St. Ry. Co.  Detroit, Mich.	600,000 8,000,000 2,000,000 8,500,000 1,500,000 1,000,000 200,000 600,000	2,500,000 2,000,000 1,249,000 1,500,000 1,000,000	1922 1909 1918 1918 1910 1922 1915	M. & S. M. & N.	106½ 118½ 105½ 106	107 114½ 106 107 	Pittsburg, Pa.  Date of Quotation—Mar 26 1500  Birmingham, Knox & Allentown6s. Central Traction Co	500,000 875,000 1,250,000 1,500,000 1,250,000 250,000 250,000 1,500,000 1,500,000 1,500,000 1,500,000 800,000	500,060 875,000 1,250,000 1,500,000 50,000 750,000 250,000 750,000 1,500,000 1,500,000 250,000 250,000 1,400,000 2,000,000 500,000	1980 1927 1980 1918 1942 1928 1924 1927 1929 1922 1980	A. & O. J. & J. J. & J. J. & J. M. & N. J. & J. M. & N. J. & J.	109%	118
Date of Quotation—Mar 26, 1900, †Detroit Citisens' St. Ry	7,000,000 400,000 1,800,000	8,885,000 877,000 1,800,000	1902	A. & O.	105	102½ 106½	Providence R. I.  Date of Quotation—Mar 26 1900.  Newport Street ByCoupon 5 Inited Trac. & Elec. Co	50,000		1910	J. & D.	116	118
New Haven Conn.  Date of Quotation- Mar 26 1100  New Haven St. Ry	600,000 250,000 100,000 100,000	600,000 250,000 500,000 24,000	1914 1912	J&D M&N M&S	111 111 109	 	St. Louis.  Date of Quotation- Mar 26, 1600  Baden & St. Louis RR1st mtg. 5s. Cass Ave. & Fair Gds Ry1st mtg. 5s, Citizens' Raliway Co1st mtg. 5s. Comp. Hts. Un. De. & Mer. Ter 1st	\$000,000 1,600,000 2,000,000 1 660 000	250,000 1,600,000 1,800,000 000 000	1912 1907	J & J	100 102 109 117	102 1021 1094 118

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#### PASSENGER RAILWAY.

NAME.	Authorized.		. !	Interest	i	
	2402012041	Issued.	Due	periods.	Bid.	Asked
St. Louis.	i		<u>' '</u>	1	<u></u>	<del>!</del>
Date of Quotation-Mar 26, 1100			1		l	
	400 000	400 000	100=		1,,,	
efferson Avenue Bylst mig. 5s indell By. Colst mig. 5		1,500,000	1911	M. & N. F. & A.	108 108	105
issouri RR. Co		700,000	1916	M. & S.	105	106
Mound City RB. Colst mtg. 68	.  400,000	800,000	1910	A. & O.	100	102
eople's RR. Colst mtg. 6s	. 125,000 75,000	125,000 75.000	1902	J. & D. M. & N.		
People's RR. Co2d mtg. 7s cople's RR. CoCons. mtg. 6s	1,000,000	800,000	1904	J. & J.		
t. Louis & E. St. L. Electriclst mtg. 50	75,000	75,000	1905		100	101
Louis BR. Colst mtg. 58	2,000,000 2,000,000	2,000,000 1,400,000	1900 1921		995	100
St. Louis & Sub. Rylst mtg. g. 5s Louis & Sub. RyIncome 5s	800 000	800,000			80	84
Southern Electric ByCons. mtg. 68	. 500,000	500,000	1909	M. & N.	106	108
I PAIOL WASHING OF THAT THE HIS W. R. OR	. 000,000	500,000 1,091,000	1918	J. & J. A. & O.	116 100	118 100)
nion Depot RR. Colst cons. mtg. 6s nion Depot RB. CoCons. mtg. 6s		1,787,000			121	122
†Controlled by St. Louis BB. Co.	1					
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de. San Francisco Cal.	1					
Date of Quotation—Mar, 1900.			]			
alifornia St. Cable RRlst mtg. g. 5s	. 1,000,000	900,000	1915	J. & J.	114	117
Ferries & Cliff House Bylst mtg. 68	650,000			M. & 8.	****	117
eary St., Park & Ocean BRlst. mtg. 5s	. 1,000.000		1921	A. & O.	,,,,,	95
arket St. Oable By. CoIst mig. g. os.	. 0,000,000	8,000,000	1918	J. & J.	1265	•••••
fetropolitan By. Colst mtg. Omnibus Cable Colst mtg. 6s.		2,000,000	1918	A. & O.	126%	
Park & Cliff House BBlst mtg. 6s.	850,000		1912	J. & J.	105%	107
ark & Ocean RRlst mtg. 6s.	250,000 700,000		1914 1912	J. & J.	115	105
owell St. Rylst mtg. 6s. tter St. Ry. Colst mtg. g. 5s.					• • • •	125
Controlled by Market St. Ry. Co.		,			••••	******
Washington D.C.						
Date of Quotation-Mar 26, 1900				i		
elt By. CoOpis mtg 5s.	500,000		1920			••••
olumbia Ry mtg. 68.	500,000 200,000		1914 1911	A. & O.	182	•••••
ekington & Soldiers' Home. 'mtg. 68, etropolitan BB. CoColl tr. cons. 68,	500,000		1901	J. & D. J. & J.		•••••
\$50,000 in escrow to retire 1st mtg.bds.	]	,		0.00.		•••••
Miscellaneous.	1					
Date of Quotation-Mar 26, 1900.	1			i		
ridgeport Traction Colst mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
affalo (N. Y.) Ry. CoCons. mtg. 5s.	5,000,000	8,548,000	1931	F. & A.	118	•
'tizens' St. R. (Ind'polis).lst cons.m.5s rosstown St. Ry. (Buffalo)lst. mtg.5s.		8,000,000		M. & N.	104	105
olumbus (O.) St. Rylst cons. g. 5s.		2,866,000 2,261,000		M. & N.	112	118
nsolidated Traction (N. J.)lst mtg.5s	15.000.000	18,965,000	1933	J. & J. J. & D.	1115	1113
rosst'n St. Ry. (Colu's, O.)lst mtg.g.5s	2,000,000	572,000	1933	J. & D.	115	1155
enver Oity Cable Rylst mtg. g. 6s. enver Con. Tram'y CoOon. m. g. 5s.		8,800,000 922,000	1920	J. & J.	20	
misville (Kv.) Rvlst cons. mtg. g.5s.	6 000 000	4,981,000	1000	A. & O. J. & J.	80 119	<b>85</b> 1193
Inneapolis St. Rylst cons. mtg. g. 5s No. Hudson Co.Ry.(N.J.).Cons.mtg. 5s J. Hudson Co.Ry.(N.J.)2d mtg. 5s.	5,000,000	1,050,000	1919	J. & J.	110%	1109
No. Hudson Co.Ry.(N.J.).Cons.mig. 58	8,000,000	2,378,000 550,000	1928	J. & J.	108	•••••
N Hudgon Oo. KV. (N. J.)Deb. 68.	500 000	489 000	1902	M. & N.   F. & A.	• • • •	•••••
sterson (N. J.) RyCons. mtg. g. 6s. ochester (N. Y.) Rylst mtg. 5s.	1,250,000	1,000,000	1981	J. & D.	::::	
Paul City RyOons. g. 5s.		2,000,000 4,298,000	1390	A. & O.	•::::	•••••
Paul City RyDeb. g. 6s.	1,000,000	1,000,000	1900	•••••	105 103	106
	1 1		ı		100	••••
\$1,000,000 in escrow to retire 1st and mtg. bds.	1	ŀ	1			
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iffalo Rv. Co.						
uffalo Ry. Co. [\$760,000 in escrow to retire bonds of		l	- 1	l	1	
uffalo Ry. Co. [\$760,000 in escrow to retire bonds of O. St. RR. Co.	1					
offalo Ry. Co. [\$760,000 in escrow to retire bonds of	1					

# ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

Boston, Mass. *Data of Quotation—Mar 26, 1900.						
Delaware Gas Lt. Co.,lst m. 5s, g.		300,000			106	•••••
Edison Elec. Illuminating Oo., Boston General Electric Oo., gold coup, deb. 5s		8,750,000	1922	Quar.	157 116	••••
Pittsburg Pa						
Date of Quotation—May 26, 1900 Allegheny County Light Co	500,000	l	1911	J. & J.	110	*****
Westinghouse Elec. & Mig. Co. Scrip 6s.	195,570		•••••	M. & 8.	••••	•••••
Miscellaneous.—(Mar 26, 1900.) Edison El. Illg. Oo. (N. York) 1st m. 5s	4,812,000	4,812,000	1910		109	
Edison El. Ilig. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993		124	
Edison Elec. Ilig. Oo. (Brooklyn) Edison Electric Light (Philadelphia)	5,700,000 2,000,000	5,000,000	1940	••••	1221/	124
Kings Co. El. Lt. & Pow. Co.1st mtg. 5s. Kings Co. El. Lt. & Po. Co.pur. money 6s	2,500,000 5,176,000	2,500,000 5,176,000	1937 1997		100 120	103 122
Milwaukee El. Ry & Lt. Co.lst con. g. 5s. United Elec, Light & Power Co(N. Y.)	8,000,000 5,000,000	6,103,000		F. & A.	1023/2	••••
TELEDUONE	440	TE! E!	20	ADU		

#### TELEPHONE AND TELEGRAPH.

Date of Quotation—Mar 26, 1900,  American Bell Telephone	1908	•••••	1001/4  114 108	101 115 105
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### ALLIED INDUSTRIES.

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Miscellaneous.			1 1			
Date of Quetation-Mar 26, 1100			1 1			
American Electric Heating78.	500,000	5 10,000		********	••••	•••••
Armington & Sims Engine Co	*******	•••••			•••••	25
Barney & Smith Car Co6s.	********	•••••	1942	J. & J.	106	107
Carborundum Mfg Co68.		••••	1904	J & D.		•••••
Worthington Pump Co	75,000	*******	ļ\	••	115	120
Unlisted tNominal.			-	-		

# NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 161@161c.; Lake, 161@17c.; casting, 16@161c.

The Edison Electric Company, of Cincinnati, has declared a quarterly dividend of 11 per cent., payable April 12.

The Boston Electric Light Company has declared a regular quarterly dividend of \$2, payable April 14. Books close March 31 and reopen April 16.

Stockholders of the Bell Telephone Company, of Philadelphia, ha the proposition to increase the capital stock from \$4,000,000 to \$6,000,000.

The Capital Traction Company of Washington has declared a quarterly dividend of 1 per cent., thereby raising the rate from 3 to 4 per cent. per annum.

The Metropolitan Street Railway Company has declared its regular quarterly dividend of lipper cent., payable April 16. Books close March 29 and reopen April 17.

For the first twenty days of March the traffic on the Metropolitan West Side "L" Railway of Chicago showed a gain of about 23 per cent. over the same period of last year.

The Hartford Electric Light Company has offered \$10 a share for the stock of the old Light and Power Company, the par value of whose stock is \$25, conditioned on getting all the stock.

The directors of the Eric Telegraph and Telephone Company have declared dividend No. 66, 1; per cent., psyable April 9, to stock of record March 31. Books close March 31, and reopen April 9.

The directors of the Commonwealth Electric Company of Chicago have authorized an additional issue of \$500,000 of bonds, of which \$150,000 will be put out immediately. The proceeds will be issued for extensions.

The annual report of the Massachussetts (443 and Electric Light Commissioners for the year 1899 shows gross earnings, \$6,334,414; net, \$2,661,648; balance after charges, \$1,956,125, and surplus after dividends, \$467,896.

The shareholders of the Montreal Street Railway Company have authorized the issue of \$1,000,000 new stock to reimburse the company for amounts already expended, and providing for further extensions of the company's lines, power-plant, rolling stock, etc.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 2)(22; New York Electric Vehicle Transportation, 11(2)11; New Eugland Transportation, 6½(2)7; Telegraph & Telephone Company of America,

New England Transportation, 62@7; Telegraph & Telephone Company of America, 4½@42; Gramophone, 49@5(4).

The New Telephone Company of Indianapolis has filed a mortgage with the county recorder for \$8.00,000 in favor of the Central Trust Company of New York and William F. Churchman. The mcrtgage is to become due in 1920, bearing 5 per cent. interest, payable semi-annually in gold.

A bill has been introduced in the U. S. Senate to incorporate the Columbia Telephone and Telegraph Company with a capital stock of \$75,000, with power to increase to \$2,000,000. Power to consolidate with other companies is given and the consolidated company shall have the rights conferred in this most liberal charter. charter.

Mr. Charles T. Yerkes, in discussing the prospects for a consolidation of the elevated roads in Chicago, is reported as saying: "Most of the larger holders of elevated stocks are in favor of consolidation, but they are not by any means a unit in regard to terms. The matter is not being seriously discussed officially at present. I regard the consolidation, however, as something that will take place in the future."

The renewed speculative boom in copper-mining stocks which seemed likely to develop some weeks ago has measurably disappeared, although prices for securities of that description in the Boston and New York markets hold firm, and there is more or less interest shown in the trading on account of the reports of new deals and combinations which will have a tendency to unite properties and interests that in the past have often exhibited more or less divergency.

The Middlesex and Somerset Traction Company has filed a mor; gage for \$1,500,000 at the county clerk's office in Newark, N. J., to cover 1,500 gold bonds of \$1,000 each, which are to be i-sued by the company. This company is the one formed by the consolidation of the Brunswick Traction Company, the New York and Philadelphia Traction Company and the New Brunswick City Railway Company. The mortgage covers the \$500,000 issue of bonds of the Brunswick Traction Company.

The mortgage is given to the Fidelity Trust Company of Newark.

The mortgage is given to the Fidelity Trust Company of Newark.

Directors of the Electric Vehicle Company have declared the regular quarterly dividend of 2 per cent. on the company's preferred stock, payable April 15. No action in regard to a dividend on the common stock has been taken as the company's charter requires the payment of the full year's dividend on the preferred stock before anything is paid on the common. Friends of the company, however, intimate that the company could readily pay dividends on the common out of last year's surplus earnings, but thought it not advisable to do so, as it was constructing a larger number of new vehicles and desired the surplus cash for that purpose.

At a meeting of the directors of the Third Avenue Railroad Company on the afternoon of March 21, the resignations were accepted of John E. Parsons, William H. Curtis, David C. Audrews, Alexander Hadden, John Byrnes, John H. Waydell, and G. Howland Leavitt. Their successors, elected to form a Metropolitan majority, are Grant B. Schley, Walter S. Johnson, Edward M. Burghard, William C. Whitney, Thomas F. Ryan, John D. Crimmins and H. H. Vreeland. The following old directors are retained: Henry Hart, A. J. Elias, Edward Lauterbach, Samuel S. Riker, Henry Iden, Charles Remsen. The officers are: President, H. H. Vreeland; vice president, Henry Hart; secretary, W. N. Amory; treasurer, John Beaver.

Stockholders of the Electric Storage Battery Company at their annual meeting on the 21st inst. elected the following directors: P. A. B. Widener, W. L. Elkins, Daniel H. Shea, George A. Huhn, I. Regan, Herbert Lloyd, Thomas Dolan, W. W. Gibbs, Grant B. Schley, Isaac L. Rive, George Philler, Rudolph Ellis, Joseph F. Sinnot, George H. Day and Philip T. Dodge. The report of operations for the year 1899, submitted by President Day, shows that great progress has been made by the company. Gross sales of its products were \$2,122,679, compared with but \$1,163,584 in 1898. Neteranings aggregated \$924,523, an increase compared with the preceding year of \$6,000,000 capital stock.

In connection with the recent announcement that directors of the New Eng.

In connection with the recent announcement that directors of the New England Electric Veh cle Transportation Company have recommended a reduction of the capital from \$25,000,000 to \$5,000,000, it may be of interest to note that a reduction in the capital of the Illinois Electric Vehicle Transportation Company is also contemplated. A special Chicago dispatch to the Beston Transcript says: "The board of directors of the Illinois Electric Vehicle Transportation Company has voted to recommend to the the stockholders a reduction in the capital from \$25,000,000 to \$2,500,000. The matter will be acted on at a special meeting of stockholders to be held on April 5, one hour before the annual meeting. Of the \$2,500,000,000 to \$2,000,000. The decrease in the stock will make the par value of the shares \$10, of which 50 per cent. is paid in up to the present time. It is probable that at the annual meeting the stockholders will instruct the board of directors not to call the second installment of \$5 a share in one payment, but to ask for it \$1 a share at a time as needed." time as needed.

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No. 13

# **FLECTRICITY**

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# EDITORIAL NOTES.

A Chance for Coal Mine and Solar Engine Owners. All accounts from Europe go to show that certain countries on that continent, notably Ger-

many and Russia, are experiencing a coal famine such as has never before been felt. This condition of affairs, which is becoming a very serious matter to the manufacturers and owners of electric lighting and kindred plants, is said to be due to the impossibility of obtaining a supply from the mines of Great Britain. Referring to this subject Consul General Mason of Berlin in a communication to the State Department says:

"Letters are received at this Consulate from importers of English anthracite and gas coals complaining of the meagre supply and high prices, and asking to be put into communication with American exporters of those grades. If, in addition to the enormous quantity of coal now being consumed in the United States, there remains any considerable surplus for export, and the conditions of freight are not prohibitory, the present season offers a rare and fertile opportunity to establish in the German market the standard grades of American anthracite and gas coals.

"Each succeeding day during the past fortnight has increased the general deficit of fuel, and the situation has become critical and ominous for the manufactures and export trade of Germany. Numerous important glass, porcelain and machine factories in Silesia and Saxony have been obliged to shut down for want of fuel; there are a dozen electric lighting and power plants in this country which have less than a fortnight's coal provision on hand and no source from which to obtain further supplies.

"In Russia the situation is equally urgent and critical. The enormous and rapid development of railways and certain manufactures in that country during the past three years has completely outrun the limited domestic coal supply, so that naphtha fuel, which has been hitherto largely used, has advanced in price from 4 to 19 copecks (2.06 to 9.8 cents), and the Russian Government has sought to ease the pressure by suspending for an indefinite period the usual prohibitory import duty of \$2.80 per per ton on coal."

As is well known England has heretofore

been the country upon which most of the nations on the continent have relied for fuel, for outside of France no European country produces sufficient coal even for its home demand, and now that the mines of Great Britain are failing, the natural inference is that the necessary coal for turning the wheels of manufacture in Germany and elsewhere will have to be obtained from this side of the Atlantic.

Besides furnishing a golden opportunity for our coal exporters, the time would seem ripe for some of the gentlemen who have invented machines for utilizing the heat of the sun, and regarding which so much has appeared of late, to step forward and show what their devices are capable of doing. During the past few years at least half a dozen so-called solar engines have been been brought out, which, if any one of them is capable of accomplishing one-tenth of what has been claimed for it in the way of utilizing the heat of the sun in operating machinery, should make its owner a multi-millionaire if introduced without loss of time into Germany.

#### \* \* \*

A Trolley Automobile. In a recent issue of "L'Industrie Electrique" of Paris, there appears an article from the pen of

Prof. Hospitalier, descriptive of what might be termed an trolley-automobile, the invention of M. Lombard-Gerin. The arrangement, in a word, consists in doing away with the storage battery on the vehicle, and connecting the motor by means of a flexible cable to a self-propelling overhead trolley, which rests on two hard drawn copper wires suspended from twenty to thirty feet above the ground.

In order to demonstrate the practicability of his invention M. Lombard-Gerin has constructed just outside of Paris, and running along the Seine, a test line about half a mile in length. In this experiment the two overhead conductors, which are of No. 0000 wire are placed some twelve inches apart, and it is on these that the trolley runs. This unique arrangement consists of a small non-synchronous induction motor which drives, by means of three-phase currents produced by the motor on the vehicle, aluminum wheels which rest on the trolley wires. By this arrangement the speed of the trolley-which by the way only weights about 40 pounds-is dependent on the speed of the vehicle. Thus, when the carriage is brought to a standstill, current no longer passes to the trolley motor, and as a consequence it stops, and likewise when the speed of the carriage motor is increased a greater amount of current flows to the trolley motor, causing it to move faster.

To allow of vehicles moving in opposite directions passing one another, the inventor has made the flexible cable connections interchangeable, so that all it is necessary for two vehicles to do on meeting is to exchange cables, when they can continue on their respective ways. With this end in view a pole changing switch has been placed in the three-phase circuit of the trolley motor, which permits of the two conductor connections being reversed, and likewise the direction of rotation of the armature.

The flexible cable, which is made up of six conductors, two large and four small, the former leading the current from the trolley to the motor of the carriage, the latter controlling the little non-synchronous induction motor of the trolley, is twenty-five to thirty feet in length, which permits a vehicle turning out for teams without interfering with its operation, or placing undue strain on the trolley wires.

The field of usefulness of such an invention is thought to be in conjunction with trolley or steam roads, where the limited amount of traffic would not warrant the outlay for tracks, but where the trolley-automobile would prove of value to farmers or manufacturers by furnishing them with a cheap and rapid means of transporting their goods or products to a shipping point.

¥

A Setback for Three-Cent Fares.

In the last issue of ELECTRICITY was briefly mentioned the fact, in the Legal Notes, that the Citizens' Street

Railway Company of Detroit, Mich., had defeated the city authorities in their attempt to secure a reduction of fares on the lines of the company from five cents, which the city charter permitted the company to charge, to three cents.

We have just received the voluminous decision, which Judge Swan of the United States District Court handed down, and it is very evident that the agitation led by Governor Pingree for three-cent fares has gone "the way of all bad agitations."

When Governor Pingree and his followers in Detroit sprung the scheme for the reduction of fares upon the Citizens' Street, Railway Company the company refused to accede to the demand on the ground, first, that it could not afford to do so, and second, that it did not have to do so. The Detroit Common Council replied that the charter provision authorized it to override this refusal. The railway company maintained its rights, disregarded the ordinance of the Council, and appealed to the courts for a perpetual injunction against its enforcement. It held that the ordinance was a violation of contract, and also an attempt to deprive it of a reasonable income on its investment. The city contended that the charter not only granted the right to make the reduction, but that the reduction was a proper exercise of the police power. Judge Swan, in his decision, emphatically sustains the company in its contention. He holds that the reduction is not a proper exercise of the police power, and if it was, it could not be exercised to deprive the company of vested interests without compensation. He holds, moreover, that even the

State Legislature could not exercise the power that the Common Council had arrogated to itself. A sequestration of any part of the company's earnings would be confiscation.

Of course the city authorities and all good Pingreeites are dissatisfied with this decision of the United States Circuit Court, and are agitating for an appeal to the United States Supreme Court, but here again they are confronted with a famous decision that ought to have a good effect on reasonable minds. In the Nebraska freight case decision the State Legislature had passed an act to reduce freight. rates below a point that the railroads thought profitable. In sustaining their position, Justice Harlan of the United States Supreme Court, who read the opinion, held that a railroad corporation is a person within the meaning of the fourteenth amendment, declaring that no State shall deprive any person of property without due process of law, nor deny any person within its jurisdiction the equal protection of the laws. "A State enactment or regulation," he added, stating the principle controlling his decision, a principle which he said must be regarded as settled, "made under the authority of a State enactment, establishing such rates for the transportation of persons or property by railroads as will not admit of the carrier earning such compensation as under all the circumstances is just to it and to the public, would deprive such carrier of its property without due process of law, and deny it the equal protection of the laws, and would, therefore, be repugnant to the fourteenth amendment of the constitution of the United States."

It will be an easy matter for the Citizens' Street Railway Company to show that the proposed reduction of its fare would not permit it to earn "such compensation as, under all the circumstances, is just to it," and if the wise city fathers of Detroit are really anxious to protect the interests of the taxpayers of the city they will let the matter drop, as it is morally certain that the decision of the Supreme Court would be against them.

## UNDER THE SEARCHLIGHT.

# Notes and Comments on Various Topics.

It now looks as though Newark, N. J., would have an Industrial Exposition in 1902. This will be the first exposition of the kind in that locality since the one held in 1872, and will it is thought serve to bring the products and business standing of that city prominently before the whole world.

It is stated that the Manhattan Elevated Railroad Company is to build an extension from its present terminus at 177th street and Third avenue in this city to Fordham, a distance of a mile and a half.

The first electric street railway car ever operated in Santiago, Chili, went successfully over the line on Sunday last. A great deal of interest was taken in the event by the inhabitants.

The Baltimore and Ohio Railroad will establish an electric automobile service in connection with its trains at Washington, D. C. The automobiles are made especially for that service and are so built that two small trunks can be carried on the supports at the rear of the vehicle and the top of the cab provides

ample room for small traveling bags and hand luggage. The cabs are lighted by electricity and in each is a clock and a dial showing the distance traveled, the time the cab is in use, and the amount of fare the passenger should pay.

A St. Louis dispatch says that Vice-President and General Manager E. P. Bryan of the St. Louis Terminal Association has tendered his resignation to accept the position of general manager of the New York Rapid Transit Subway Company under a contract for a term of five years at a salary of \$20,000 per annum.

The successful application of ozone for bleaching yarns has been made recently in Silesia, and an electrical plant for the work has been established. Bleaching by ozone is a natural system, and one that has been sought for some time, but not sufficient ozone could be obtained to make the experiment successful. If the new plant proves all that is claimed for it the adoption of the same process of bleaching wool, silk and cotton will follow in this country. Ozone bleaching is considered far superior to sulphur bleaching, as the white produced would be permanent and would not disappear when the material was washed. The sulphur bleaching also tends to injure the fabric, while the ozone has no such effect on cotton, silk or wool. The new process consists in forcing air by electricity through a series of driers to free it from moisture and then through an ozonizer chamber.

It is announced that passenger boats propelled exclusively by electricity will make their appearance on the Seine River, early this spring, in connection with the Paris Exposition. These boats will be charged by an electric machine on the river bank at Asnieres, in front of their mooring station. They will run at a rapid speed, without noise or smoke, and will be able to make 63 miles without its being necessary to recharge the batteries.

A GREAT improvement has lately been made by placing a motor engine and an electric capstan at the drawbridge over Wallabout Creek, on Washington avenue in Brooklyn, which will be of material benefit to Wallabout Market men and others having business at the market. The channel heretofore has been frequently blocked by canal boats, which have been unable to get through without considerable tugging at ropes on the part of the owners and crew. The bridge has accordingly been kept open for an hour or more at a time. By means of the new motor and capstan a rope may now be attached to the boat and it can be hauled through in a short time.

At Tomahawk, Wis., electricity from water power is now being used to run the machinery of the new Marinette, Tomahawk and Western Railway Company's elevator. About forty carloads of oats, wheat and corn, it is claimed, are being unloaded daily into the elevator.

Three telegraph machines have been installed in the Pennsylvania Railroad telegraph operator's room in the Union Station at Harrisburg, Pa. They are new quadruplex machines of the very latest design for sending four messages over one wire at the same time. They were put in operation for the first trial on Monday and are working in a very satisfactory manner. Two wires are worked to Philadelphia, one to Altoona and one to Pittsburg. The



machines are operated by seven new dynomotors, which have been installed in the cellar of the Union Station and have displaced the old jar batteries.

The Hatch Electric Smelter Company of Milwaukee, Wis., has about completed its large demonstrating plant and it is expected that stockholders from all over the country will be in attendance at the formal test in a few weeks. The company will treat iron ores principally.

A BILL of complaint has been filed in the United States Circuit Court by the Societé Anonyme Pour la Transmission de la Force par l'Electricite of Paris, France, against the Hartford (Conn.) Electric Light Company for alleged infringement of an alternating current electrodynamic machine and of a method of operating the same on which letters patent No. 529,272 were issued by the United States Patent Office October 16, 1894, and were assigned by the inventors, Maurice Hutin and Maurice LeBlanc, to the complainant. The complainant prays for an injunction against, the use, sale or manufacture of such instruments, and asks for an accounting, and that the defendant be required to pay over all profits resulting from the use and sale of such instrument.

The Sao Paulo Light & Power Company of Brazil has recently contracted for the following material in the United States: 50,000 feet of weatherproof cable, 6,000 Brookfield insulators and 7,000 other insulators. Contracts for these goods, together with others which have been awarded to United States firms, show an aggregate value of over \$100,000.

It is understood that the large cars on the Third Avenue Railroad Company's lines will be done away with under the new management in the near future. The cars are said to be the largest in use on any street railway in the United States. They are 41 feet in length over all, and the body of the car is 32 feet long. The windows are so arranged that they can be dropped down entirely out of sight, converting the car into an open one for summer use. The reason given for doing away with this type of car is that the cross seats take up too much room, thus excluding passengers.

The double turrets of the new battleship Kearsarge, which are operated by electricity, have recently been subjected to a severe test and have proven satisfactory. In a telegram to the Navy Department Capt. William N. Folger said: "The double turret was thoroughly tested, and is an assured success, both from military and structural standpoints. There was no interference between the planes of guns or inconvenience from blasts or smoke. The structure, tested with simultaneous discharge of three guns, is amply strong to withstand the united shock of the four guns of either turret."

An English daily is responsible for the statement that during the first few weeks of the Paris Exposition visitors will not be able to use the new electric railway owing to the delay in completing the same. The trials were originally fixed to take place at the beginning of April, but the date now given is May 15. The railway will, however, be a great relief to the traffic when it does begin running, as it is to be a very commodious line. The carriages are

to be of the corridor pattern, carrying some fifty passengers, and will each be lit by ten electric lamps. Separate doors for the entrance and egress of passengers are to be provided, thus avoiding confusion and crush on the platforms. The trains are to run at very frequent intervals, and the run of nine miles from Vincennes to the Bois de Boulogne is to be accomplished in twenty-seven minutes, including stoppages. The question of the ventilation of the tunnels has now arisen, and it is stated that, in default of shafts, it will be absolutely necessary for the public safety to place pumps worked by electricity on the line between the stations to ventilate the tunnels.

The Brooklyn Rapid Transit Company should have little difficulty in handling travel this summer. It is now receiving some of the 300 new open cars ordered some time ago, and expects to have them all ready with the return of warm weather. The company has added 500 new open cars to its equipment in two years, including the 300 now in course of delivery.

Hamilton King, Consul General to Bangkok, in a communication to the Department of State, says of the industrial development of Siam: "Rice cultivation is the principal industry of Siam. There are twenty-six steam rice mills in Bangkok, and although the first one in the country was started by an American, none are owned by Americans to-day. Four are European, and the rest are owned or managed by Chinese. Some of these Chinese firms have a very large capital. Seven of the mills have their own electric light plants, one of which was furnished by an American house.

UNDER the title of "A Bachelor of Science?" the London "Electrician" publishes an item which states that in an account of Mr. Marconi's recent experiments before the King of the Belgians, "L'Etoile Belge" refers to Major Flood Page, chairman of the Wireless Telegraph and Signal Company, as "President de la Société Wiveless,"

The following are the customs dues for electrical material imported into the Argentine Republic during the current year: Machinery, in general, 10 per cent ad valorem; iron or steel galvanized wire, up to No. 14, 10 per cent; wire or cables, over 5 millimeters in diameter, for electrical purposes and the necessary articles for laying submarine cables, 10 per cent: plants for public electric-lighting stations, 10 per cent: automobiles, 10 per cent. Rails, tie-bars, wedges, chairs, and all material necessary for electric traction purposes, are admitted duty free.

GEORGE C. HALE, who has for nineteen years been chief fire marshal in Kansas City, recently conducted a successful test of his invention -an automatic fire alarm which was witnessed by several interested in the device. In discussing his invention Mr. Hale said: "My automatic fire-alarm system supplies the missing link in the fire service of to-day. It sounds an immediate alarm. At intervals on the ceilings of the different floors of a building pro tected by this system are thermostats. As soon as the room attains a certain temperature these thermostats-being connected with a phonograph in the office by a system of wires -cause recorded sentences on the phonograph cylinder to be ground out over the telephone. The public telephone can be used, my invention being so perfected that the phonograph automatically switches itself over in front of the transmitter. The Central Telephone Company can then give the alarm to the fire department. The automatic fire-alarm system takes the place of the watchman. It never sleeps, and the phonograph will continue to repeat the location of the fire until it is shut off."

An automatic bicycle pump has recently been brought out operated by means of an electric motor. On dropping a nickel into a slot an electric circuit is completed which sets in motion the motor and pump.

NEWARK, N. J., is beginning to experience the same trouble with its water mains that other cities have in which the overhead trolley is to be found. A section of pipe recently tested was at a positive potential to the trolley rails, proving conclusively that electrolytic action was going on.

THE Chicago Electric Traction Company, the only storage battery line in Chicago, will go back to the overhead trolley system in the next few weeks. Eastern owners of the company's stock decided on this change at a meeting in New York recently, and the change will be made as fast as the trolley system can be installed. This marks the conclusion of a costly experiment in the Windy City to demonstrate the value of accumulators in traction work.

The electric exhibit at the Paris Exposition bids fair to be one of the most attractive parts of the show. There will be a complete retrospective exhibit of electrical and mechanical apparatus of historical character, and the special exhibit will be housed in the "Court of Honor."

THE San Francisco (Cal.) "Chronicle" apparently has little faith in compressed air as a motive power, for in a recent issue it says: "Compressed air as a power agent is not free from danger. Two accidents have occurred from its use on the Metropolitan Street Railway in New York through the bursting of the reservoir or bottle containing it attached to the cars. The later one, which happened a few days ago, demolished the car, seriously injured three men and slightly injured a dozen others. It is evident that compressed air reservoirs will have to be supplied with safety valves similar to those used on steam boilers to secure them against explosions, or the risk of life and limb will be too great to warrant the employment of this agent for passenger traction purposes."

Mr. C. H. Cahan, of Halifax, N. S., has just returned from British Guiana and Trinidad where he has been for some time in the interests of a Montreal and Halifax syndicate, incorporated as the Demerara Electric Company. Sir Willam Van Horne is president, Hon. Senator Drummond, vice-president, and B. F. Pearson, of Halifax, secretary. The company has obtained in the colony of British Guiana exclusive electric lighting, power and tramway franchises for the city of Georgetown and its environments within a radius of five miles. The company has purchased all existing electric light plants and mule tramways in the city, and is now completing the installation of electric traction on the tramway, which will be fully accomplished by July 31 next. The capital of the Demerara Company is made up of tonds for \$400,000 and \$850,000 of capital stock.

#### FREDONIA POWER HOUSE FIRE.

#### BY FRANK C. PERKINS.

The recent fire at Fredonia, N. Y., not only destroyed a large portion of the town but practically wiped out the entire plant of the Dunkirk and Fredonia Street Railway Company. Mr. M. M. Fenner of Fredonia, N. Y.,

supplying the place with electric lights, small motive power and heating many of the larger buildings by exhaust steam. The Fredonia Normal School, the postoffice and several churches were without heat and light during a day or so of severe cold weather. The characteristic qualities of all electric companies which have been burned out at once showed



FIG. 1.—GENERAL VIEW OF FREDONIA STREET RAILWAY POWER HOUSE FIRE.

is general manager and Mr. Frank May of Dunkirk, N. Y., president. The car barns, motor cars and power house were entirely destroyed. The buildings, cars and power equipment were absolutely without insurance.

The accompanying illustrations, Figs. 1 and

themselves, and within a short time the plant was furnishing heat, light and power. The trolley line was also soon in operation, a temporary plant furnishing the necessary current until the permanent power plant is constructed.

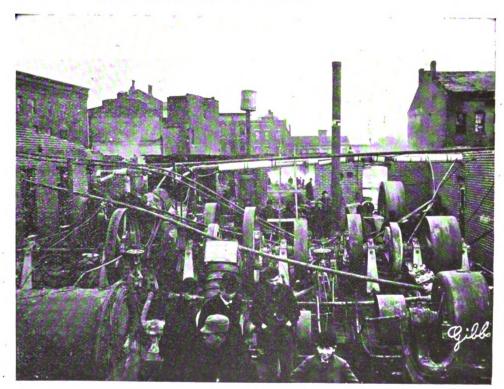


FIG. 2.—INTERIOR VIEW OF FREDONIA STREET RAILWAY POWER HOUSE FIRE.

2, give a good idea of the wreck as it appeared the day after the fire. The company was at the time operating the only electric road between Dunkirk and Fredonia and was also This power plant was one of the few installations where the five wire system was tested for local lighting and power work, utilizing the surplus power from the street railway plant. Several Edison bipolar generators were coupled together on the same base, the armature shafts all being direct connected. The five wire system of distribution was employed, giving 100 volts for ordinary incandescent lighting, between any two wires; 200 volts or 500 volts being utilized for motors. This system was introduced in Paris on a large scale and was fully illustrated and described in Electricity in Vol. II, No. 9, page 102. The Dunkirk and Fredonia Street Railway Company operate over four miles of track and had about a dozen motor cars in service.

# THE DAMPING OF GALVANOMETER NEEDLES.

[From our London Correspondent]

Before the Physical Society on March 9 Mr. M. Solomon read a paper on "The Damping of Galvanometer Needles," He said that the solution of the equation of motion for a magnetic needle, swinging in a uniform magnetic field, pointed to the conclusion that the ratio of the period to the logarithmic decrement is independent of either the moment of the needle, or the strength of the controlling field, and is simply a function of the damping coefficient and the moment of inertia of the moving system. This ratio should, therefore, be constant if these latter quantities are constant. Experiments to test the constancy of period to logarithmic decrement have been conducted at the Central Technical College at various times since 1891, and they have invariably pointed to a variation in the value of the ratio. The object of the present paper is to discover the cause of this variation. It may be due to an alteration in the moment of inertia, or to an alteration in the damping coefficient. If the control magnets are either directly above or directly below the needle there is no chance of any change in the moment of inertia. The damping coefficient depends on three things: (1) viscosity of the air, (2) viscosity of the suspension, and (3) eddy currents. The author has carried out experiments with a galvanometer on open circuit, and finds a constant value for the ratio. The viscosity of the air and suspension, therefore, cause no variation. Upon closing the circuit, and repeating the experiments, the value of period over logarithmic decrements alters. The variation is, therefore, due to eddy currents. The damping factor due to eddy currents may vary owing to three causes: (1) change in moment of needle due to change in field strength; (2) effects of self-induction; (3) effects of rise of temperature on the resistance of the coils. The author points out that the two latter causes would tend to alter the ratio in the wrong direction. and he therefore concludes that the variation is due to an alteration in the strength of the swinging needle produced by altering the strength of the controlling field.

A brief discussion followed, after which Mr. G. W. Walker contributed a paper on "The Distribution of Gas in an Electric Field." He considered a gas as consisting of a number of molecules each containing two atoms of equal mass, one positively and the other negatively charged with electricity. When under the action of electrical forces some of the molecules split up and we arrive eventually at a steady state in which there is a definite number of undissociated molecules and of free positive and free negative atoms. Treating the problem as one-dimensional, the potential at any point is expressed in general by elliptic func-



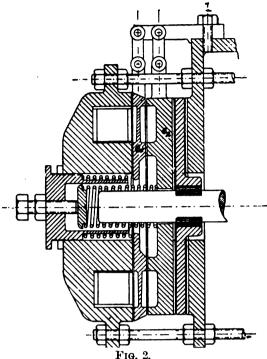
tions, and is therefore periodic. Applying the results to the case of a vacuum tube it is found that there is superimposed upon the gradual fall of potential along the tube minor periodic variations which, it is suggested, are connected with the striæ of discharge. Both the matter density and the electric density are periodic along the tube. If the places of maximum matter density coincide with the places of minimum electrical action, then whether luminosity is due to collisions or recombinations there will be maximum luminosity at these points. In general these points do not coincide, and thus the positions of maximum luminosity are not clearly defined. The analysis leads to the conclusion that the distance between the striæ is inversely proportional to the density of the gas and to the current strength, and these facts have been experimentally veri-

### AN AUTOMATIC BRAKE.\*

In many classes of machinery driven by electric motors, the necessity for some form of automatic brake has made itself felt. In the case of cranes and hoists it is required to retain the load when the motor is stopped, and in other cases for the purpose of stopping quickly and with precision.

What is required is a brake which is normally held on by a spring or weight, and which is released by an electromagnet, the exciting current of which is preferably controlled by a switch attached to the switch which starts and stops the motor. Thus, when the switch turns current on to the motor it simultaneously turns current on to the electromagnet, so releasing the brake, and when it is turned off it simul-

the fixed plate tightly together, so that the motor shaft cannot turn. An electromagnet is provided which, when energized, pulls the pressure plate back and releases the disk. In Fig. 1 an illustration is given of one of the



brakes fitted to a motor for driving a set of plate-bending rolls, the object being to get quick stops instead of having to wait for the momentum of the motor and gearing to die down. The users have found this a great advantage, as they are now able to get more work out of their rolls than they could before the brake was adopted.

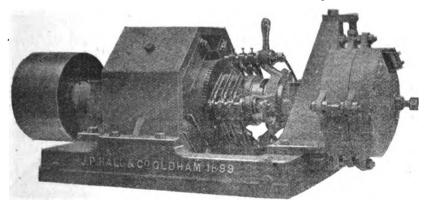


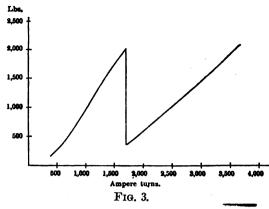
Fig. 1.

taneously interrupts the current to the motor and to the brake, so that the brake renews its grip.

An arrangement which has been used to a certain extent consists of an ordinary band brake with an electromagnet to lift the lever. This arrangement requires very careful adjustment owing to the short range through which an electromagnet acts. For the same reason any slight wear of the band or pins will cause the brake to slip, so rendering it unreliable.

The brake which we illustrate has been devised to get over this difficulty. It is constructed somewhat on the principle of a Weston friction clutch. A disk slides on a feather key on the motor shaft, and is placed between two plates, one of which is fixed to the frame of the machine, and the other swings on a link and is provided with stops to prevent rotation. This movable pressure plate is acted upon by a spring, which presses it, the disk and

Generally a simple on and off brake is all that is needed, but in some cases, and more especially in cranes, it is desirable that the brake should exert an intermediate pressure between full on and full off. The sectional drawing, Fig. 2, shows a brake arranged to give two pressures. There are two pressure plates, e1 and e2, and there are two springs, one pressing on each plate. The magnet switch in this case requires three points: "off," "on" through a resistance, and "on" to the magnet direct. The tractive force curve for one of these brakes is given in Fig. 3. This brake is intended to exert a total pressure of 4,000 lbs. with an intermediate pressure of 1,650 lbs. The plates, •1 and e2, each exert a pressure of 2,000 lbs. Referring to the curve it will be seen that as the ampere-turns round the magnet increase, its attraction increases, till at 2,000 lbs. the plate e, is pulled over, leaving the plate e, still pressing on the disk. At this point the attraction (which is now exerted between  $e_1$  and  $e_2$ ) falls to 375 lbs. owing to the magnetic short circuit formed by  $e_1$ . As the ampere-turns are further increased the thin part of  $e_1$  becomes saturated, and the magnetic potential across it rises, causing the attraction to increase till at 2,000 lbs. the plate  $e_2$  is also



pulled over, leaving the disk free. The effect obtained by this arrangement is the same as though two simple brakes were used exerting pressures of 2,000 lbs. and 1,650 lbs. respectively. It is, however, much simpler, the only addition to the simple form being the extra plate and the division of the spring into two parts.

# COPPER FROM THE ORE TO THE WIRE BAR.\*

#### BY ALBERT R. LEDOUX, M.S., PH.D.

Electrical engineers are familiar with copper in its finished form, but not all of them know where it comes from nor what are the various steps through which it passes before it gets in their hands. The production of copper on a commercial scale in the United States dates from 1845, although temporary mining of ores and smelting had been tried at intervals for one hundred years previous to that date. The production of copper in America from 1845 up to 1890 amounted in round numbers to 1,000,000 tons. Prior to 1880 Lake Superior produced nearly the whole quantity, but from 1880 to 1890 Montana and Arizona began to compete with the Lake region, and the figures for that decade are:

Lake Superior	45	per cent
Montana	36	. "
Arizona	15	"
Elsewhere:	4	66

In 1890 Montana passed its rival, the figures for that year being:

The following table shows the increase in production in the last five years. It is stated in pounds and in round numbers:

1890.	1897.
143,000,000	145,000,000
232,000,000	287,000,000
72,000,000	81,000,000
1898.	1899.
158,000,000	155,000,000
216,000,000	289,000,000
111,000,000	122,000,000
	143,000,000 252,000,000 72,000,000 1898, 158,000,000 216,000,000

In 1899 the production of the world increased 50,000 tons and the consumption nearly as much.

Copper is more easily discovered than gold because its compounds are conspicuous and its ores are blue, green or yellow, as a rule. Gold is seldom visible to the naked eye excepting in "specimen mines," which are usually not large producers.

There are three types of copper ore-metallic,

<sup>\*</sup>Synopsis of a lecture delivered before the New York Electrical Society March 2, 1900.



<sup>\*</sup> From the "Electrical Review," London.

sulphides and oxides. All three types are frequently found in the same mine or district, but, broadly speaking, the metallic mines are confined to Lake Superior. The sulphide ores have received their greatest development in Montana, and the oxide ores are characteristic of Arizona. There are many other districts producing copper, such as the veins and lenses which constitute beds in North Carolina, Tennessee, Vermont and elsewhere on the Atlantic coast. In fact, the first mining on a large scale was at the Ely mine in Vermont. At the Union copper mine, in North Carolina, veins which were operated for gold in the beginning of this century are now being reopened for copper, and a very large expenditure has been made upon the surface as well as underground to make this old property a remunerative producer.

#### METALLIC DEPOSITS.

The Lake Superior ores carry the copper in an almost chemically pure form. The metal is disseminated through lavas, sandstones and conglomerates, sometimes in masses, but usually in tiny specks, the average assay of the district being less than 4 per cent. of copper, but the distribution is so uniform and the average so sure that the Great Lake mines are among the most reliable from the point of view of the investor. The Calumet-Hecla has paid its shareholders over \$66,000,000 since 1871, and has produced nearly 1,500,000,000 pounds of copper. The ore is raised from twelve shafts, one of them over four-fifths of a mile in vertical depth, and the life of the mine is assured for many years by the ore blocked out. From this mine 5,000 tons are hoisted daily an average distance of 3,000 feet. The cost of Calumet copper laid down in New York in the form of wire bars or ingots probably does not exceed 6 cents per pound.

The Tamarack is another lake mine with a history. Its deepest shaft is 4,600 feet, and will soon reach a mile in vertical distance from the surface.

The Lake Superior ore admits of simple treatment. It is pulverized in steam stamps each handling hundreds of tons in a day When pulverized and automatically screened and separated into several grades of fineness it passes to jigs and concentrating tables or bundles. A jig is practically a sieve plunged up and down in water. The lecturer illustrated this by supposing a flour sieve to contain a mixture of white sand and shot of substantially the same size, If the sieve was forced up and down in water the ascending current would finally bring all the lighter sand to the surface leaving the heavier shot on the bottom. If the mixture flowed into the sieve continuously the light sand would overflow the side of the sieve with the water and by and by the shot would all be collected on the bottom. whence it could be continuously or intermittently removed. The finest ore in size goes to tables over which a stream of water flows-the lighter and worthless gangue being washed away while the heavier metal remaining upon the table is caught or diverted into another direction. While the ore of the Calumet prob-. ably averages 4 per cent. copper, there are other paying mines that have phenomenal records of economic working. Among these is the Atlantic. In 1898 it produced 4,500,000 pounds of copper, yielding the company 11.83 cents per pound. The average of the ore was about six-tenths of 1 per cent., or a value of \$1.40 per ton of ore raised: mining cost 90 cents, transportation 5 cents and milling 24 cents;

the total operating expenses, including freight and commissions, were \$1.3481 per ton. The copper, therefore, cost 9 cents a pound—giving a net profit of nearly 3 cents. This record is not equalled in any other copper mine.

The so-called mountain system of veins is characteristic of the Rocky Mountains and Sierra Nevadas, and, as stated, they receive their greatest development in the vicinity of Butte, Mont., as far as sulphide ores are concerned. The Butte mines are complex. There is no "bed" corresponding to the Calumet conglomerates, but sulphides are interspersed in bunches or otherwise through altered gran-The Butte district is seven miles by four in extent, but the mines that have made Butte famous underlie an area of about 3,000 by 7,000 feet. Many of the Butte mines, were started as silver propositions, the altered surface ores being rich in that metal. As depth increased rich ores grew more scarce, but at the depth of to-day, from 1,500 to 2,000 feet, the grade is quite uniform—in the neighborhood of 6 per cent, copper is the average of the camp. In their early days the Butte mines used to ship ore to sampling works in New York, which contained over 50 per cent copper. All the Butte ores contain gold and silver as well as copper. The Anaconda has produced over 1,000,000,000 pounds of copper, 50,000,000 ounces of silver and 150,000 ounces of gold. This copper mine is the largest silver producer in the world. From 3,000 to 6,000 tons of ore are mined daily from the Anaconda. The caverns produced from this extraction of ore can be readily computed. A volume equal to the building space on any one of our city blocks is excavated every month under Butte. The Anaconda supports the surface by the introduction of a forest of 60,000,000 feet of lumber yearly. The ore is carried 27 miles to the metallurgical works which reduce it. The difference in the treatment as compared with Lake Superior is due to the fact that in the first case we have only metallic copper to separate, refine and remelt into wire bars or ingots, while the sulphide ores contain a larger proportion of impurities than lake copper—the principal impurities being sulphur and iron, although arsenic, antimony, bismuth and other undesirable substances, including tellurium, are usually The metallurgy of the Butte copper present. ore consists of several stages. First, the concentration to separate the sulphides from the granite or other gangue; second, roasting to get rid of the greater part of the sulphur with its accompanying volatile impurities; third, the smelting of the roasted sulphides to form what is called a "matte:" fourth, the so-called bessemerizing of the matte to produce impure copper, and finally the refining of this impure copper. The ore arriving at the Anaconda works is discharged from the cars at the highest point, the works being situated on a side hill; it passes through crushers which break it up small enough to go into the steam stamp mills, from which being automatically senarated into various grades of fineness or size it passes to jigs similar to those employed in Lake Superior, which separate the ore from the gangue and deliver the concentrated ore at the roasting furnaces. Some of the very fine ore is treated separately on tables, the details of which it is not necessary to describe. The ore is roasted in several mechanical roasting furnaces of different make and principle. In the early days of copper smelting the sulphides were usually roasted in heaps on the ground and sometimes in so-called stalls, but

in the most modern plants the roasting is performed in mechanical furnaces.

Before describing the furnace it may be well to say that these and all concentrating works are as nearly automatic as possible. The ore descends by gravity from cars through the crushers and other apparatus to the lowest level of the works and is carried from place to place by streams of water. Even the ashes from the roasting and smelting furnaces are continuously carried away by a current of water flowing through the ash bed and they are discharged at a long distance from the works without the intervention of any hand or tool.

There are two types of roasting furnaces in Anaconda. The Bruckner furnace is a cylinder some 20 feet in length by 10 feet in diameter, lined with brick, and revolving slowly. unroasted ore goes in at one end and is discharged at the other, while the gases from the burning sulphur go up the stack. Each furnace handles about 18,000 pounds of concentrates in a day, reducing the sulphur from 40 per cent. to 10 per cent., which is a most favorable proportion for subsequent operations. It takes about one ton of coal a day to fire each furnace, the coal available in Montana being much inferior to Eastern coal. It also takes the labor of two men per day of twenty-four hours to handle the material passing through one furnace. Another type employed at the Anaconda is the Wethy furnace, which consists of three or more horizontal shelves, one above the other: at the end of each shelf, but alternating in their position, are holes through which the ore can drop from the upper to the lower level. An endless chain carries a rake along the upper shelf dragging the burning ore toward the opening through which it drops to the second shelf. The chain comes out at the end of the furnace over a sprocket wheel, re-enters the second shelf, dragging the ore in the opposite direction, whence it falls to the third, then the chain still traveling onward over a second sprocket drags the same ore along the bottom shelf from which it drops into the car ready to receive it more or less prepared for the subsequent operations.

A third type of roasting furnace now successfully employed is the so-called Nichols furnace, the invention of Mr. Frank Herreshoff. These furnaces are circular instead of rectangular in section and have rakes revolving horizontally and not traveling from one shelf to another.

The next step is the matting of the roasted ore. It is fed into an upright furnace of the so-called cupola type, which is surrounded by a water jacket to keep it cool. Coke or limestone or other necessary fluxes are added and a blast of air introduced. Under the effect of the blast and of the heat evolved the ore melts. The impurities are largely slagged off, this slag carrying iron, silica, lime, etc. and the sulphide of copper is concentrated still further into a matte, which runs about 30 per cent. of copper, or can be brought up to 45 or 50 per cent., or even higher if advisable. At this point begins the bessemerizing of the copper, which is the most important of recent discoveries in the metallurgy of this metal. The well-known Bessemer furnace, which has been used for many years in converting iron into steel, is now universally employed for taking advantage of the oxygen of the air in removing the 30 to 40 per cent, of sulphur which the matte contains. The Bessemer furnace is of various kinds, being the ordinary pear-shape "converter" with which the steel industry



has made us familiar or a simple trough. In the bottom of the converter air tubes are introduced: the molten matte is run in from the furnace and the blast turned on; the sulphur combining with the oxygen is discharged as a gas, the remainder being brought up to a purity of from 96 to over 98 per cent. of copper. Of course this copper carries with it the gold and silver which were originally present in the ore. The converter is discharged when the reaction has ceased, and the copper produced is cast into pigs or converter bars as they are called. Of course there are many details not necessary to enter into at this time. For instance, the converters are lined with various mixtures in order that the substance of the lining may unite with some of the impurities in the copper that are not volatile, and, forming a slag, be easily carried off.

The next step at Anaconda and elsewhere where converter copper is produced, carrying precious metals, is the electrolytic separation of the metals.

The ores of Arizona and of the Southwest in general are of the carbonate or oxide type as far as the surface ores are concerned-remembering, of course, that only general terms are being used and that in every district as well as in every mine there are more or less of all types of ore. In Arizona there has never been any glacial erosion which has removed the oxidized ores with all the decomposed rocks of the surface in our Northeastern States and in many parts of the Rocky Mountain range. These oxidized ores always overlie sulphides where they have not been artificially removed. As a type of the carbonate and oxide mines of the Southwest the great Copper Queen is the most worthy of attention. This mine was opened in 1880 and a small furnace operated on its ores that year. To-day it has become one of the largest mines in the world with some twenty miles of shafts, tunnels, galleries and levels, and ore in sight capable of yielding 3,000,000 pounds of copper per month for years. The occurrence of the Copper Queen's and similar ores is in limestone and in this rock they are deposited in eccentric and curious ways. Bodies of ores are come upon without the slightest indication of warning, and equally without warning they suddenly disappear. From barren rock showing no trace of copper a drill will sometimes enter a cave of great extent, the sides and walls being magnificent with blue, red and green copper stalactites, and underneath are large bodies containing thousands of tons of rich ore. In the Copper Queen there are to-day cubes of ore blocked out on all sides that exceed 400 feet on the edge. Up to 1884 this mine produced 20,000,000 pounds of copper from a body of ore which was then exhausted. Almost by accident, after groping about in all directions for another ore body, a bonanza was discovered, from which mine they are still taking out millions of pounds of copper a month and with no indication of immediate exhaustion. The surface ores of these carbonate mines could be smelted without any bessemerizing or roasting, producing in the furnace by one operation black copper equivalent to the converter bars and suitable for the electrolytic separation, but, with depth, sulphides came in, and now the Copper Queen also is bessemerizing mattes and producing converter bars which come East for their electrolytic refining. The metallurgical works of the Copper Queen are most thoroughly modern in every respect. They use the trough converters, previously mentioned, holding about 30 cwt. of matte which assays about 33 per cent. of copper. These converters are 8 feet long by 6 feet in diameter.

As has been intimated, the final stage of copper refining is the electrolytic. The lecturer stated that it was not his purpose to go into the detail description of this process before a society of electrical engineers, many of whom had been actively engaged in the electrolytic copper refining. But speaking in general he stated that up to last year all the electrolytic establishments of the country could in a sense be considered experimental, but that works erected in 1899 were probably the most perfect that could be devised for some years to come. The lecturer deplored the extreme jealousy and consequent secrecy which existed in some works, preventing the men in charge exchanging with one another improvements and variations in method for the common good of all. He stated that in the application of this process, as he had observed it in visiting various works, the differences were comparatively slight. Some used wooden vats and some slate, some prefer the arrangement in series, some in multiple arc. Some companies thought best to increase capacity by enlarging the number of tanks, thus adding to their permanent investment, others increased their permanent expense by increasing the power in a fewer number of tanks. He stated that the chief difficulty was the maintenance of a constant current density, and quoted Dr. Keller's statement that he did not believe that a current density of over 18 amperes had ever been successfully exceeded for any length of time in the United States, and that the average density did not exceed 12 to 15 amperes per square foot. He discussed briefly the relative merits of the Havden and other systems employed at different works, stating that the chief difference was in the form of the anode. In most works operating under Hayden's patent the anodes were rolled into sheets, although in one of the works in England they had successfully cast their anodes into plates not over one-quarter inch thick. He spoke of different methods of hanging the anode which were practised, stating that the Hayden system economized space as the anodes could be set more closely, thus admitting also of greater current density and a more rapid turning over of the copper, the result being to decrease the amount of metal tied up in the tanks.

The cost of the electrolytic operation at Anaconda has been published, and is stated to be three-fourths of a cent per pound of copper. In Eastern refineries, however, contracts have been made by which the refiner agrees to return to the miner all the copper, gold and silver, the assay certificates call for in the form of refined copper, gold and silver, and charges for their services in some cases are so much less than one cent per pound that it is evident that it does not cost the Eastern refiner as much as three-fourths of a cent, even including interest on money tied up in the metals in the vats.

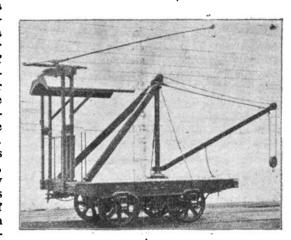
The lecture was illustrated with lantern views of Western mines, both surface and underground, views of traction, timbering, etc., also views of metallurgical mills and equip-

The day of opening of the Paris Exposition has been changed from Sunday, April 15, to Saturday, April 14, out of deference to the wishes of English and American exhibitors.

#### AN ELECTRIC LOCOMOTIVE AND CRANE COMBINED.\*

The use of electricity in manufacturing establishments is becoming more extended day by day. Its convenience in the transmission of power is a reason for its introduction, and wherever it is employed new uses are constantly suggested. For handling freight upon the railway tracks, which are in almost universal use in manufacturing establishments, it has been unusually satisfactory. The electric locomotive, while slow to make its appearance on the railroads of the country, is finding an immense field for itself on the "industrial" railways of manufacturing establishments. In this field it has already developed a greater variety of forms than the smaller steam locomotive. One of the great advantages of the electric locomotive is the flexibility of its design, and modifications are easily made. The power is variable and a new electrical equipment and an addition of weight enables the power to be increased indefinitely, in fact, up to the limit of the rails in carrying weight. In purchasing, when the type is suitable the hauling power is a matter of detail. The simplicity, economy and convenience of the machine have insured their favor wherever they have been used

In the machine illustrated, the novel combi-



COMBINED ELECTRIC LOCOMOTIVE AND CRANE.

nation has been made of crane with an electric locomotive. In addition to all the advantages which the latter machine possesses, it has made others peculiar to itself, the combination being more effective than either machine alone. It is said to be peculiarly valuable wherever large weights exceeding the power of one or two men to handle have to be lifted and transported, being capable of loading and hauling cars wherever wanted.

The machine is expected to be found particularly valuable in and about railway shops and along lines of street railways. It cannot only haul heavy loads, but pick up such weights as frogs, switches, crossings, rails, and any otherheavy material with great facility. It can load them upon cars and then haul them to points where they are wanted, and unload them with equal ease. The locomotive crane takes rails from piles and shifts them with greater facility than a gang of men, and with less danger of accidents. This facility for handling heavy goods, unloading trucks and placing weights where they may be wanted reduces the number of laborers and makes a reduction in the payroll, which is not easily estimated. Three or four men, with a machine

<sup>\*</sup> From the "Railway Age," Chicago.



of this kind should be able to easily do the work usually performed by a gang of fifteen or twenty laborers.

The overhead railway in the shop has no counterpart in the yard, but the machine shown in the engraving gives all the advantages in the yard which the overhead hoist and trolley has in the shop, with the additional advantage that it is self-propelled, and since it can move wherever the tracks are laid it has some advantages over the traveling crane. It has a 5-foot wheel base with a 31 foot overhang at each end. Where it is not necessary to carry loads on the deck of the machine adhesion may be obtained by piling ballast in the form of castings or pig-iron upon the platform. Where so desired, the machine has pockets between the sills which are filled with scrapiron. The crane is of the ordinary type, with the improvement of a hollow mast made of 4inch wrought-iron pipe, and the rope descends through this mast to the winding drum beneath the deck. The gib is of iron, and is supported by a rod. The mast is held as usual by guys, and the trolley stand is placed at one end with the controller, brake, etc. Under it is fitted a short hood for the protection of the motorman. In the design shown the gib swings through about half a circle. Where the load is to be lifted at right angles, heavier ballasting and a stronger mast are necessary. In case of necessity the platform can be made longer, so as to use it for carrying freight, and if still greater extension is needed, double trucks may be employed. In the type illustrated by increasing the amount of ballast and using large motors more than 200 horse power can be readily made available. The builders, J. G. Brill Company, have recently made one of these machines for their own use, and it is said to have already demonstrated its usefulness in and about the works.

# Automobile Display at the Pan-American Exposition.

Thomas M. Moore, recently appointed chief of transportation and machinery exhibits at the Pan-American Exposition, to be held in Buffalo, May 1 to November 1, 1901, who is working on preliminary arrangements for these exhibits, makes the following statement:

"The preliminary and merely mechanical work was our first care when we issued a letter to prospective exhibitors. The letter was sent out to the automobile manufacturers. those who make the vehicles and those who own the motor systems especially designed for the propulsion of these vehicles, and to all others who have made a study of automobiles and could aid us in making the Pan-American display of such vehicles a pronounced success. Up to now, exhibitions of automobiles have been but tentative, for the art is in its formative state and is but now reaching a point where practical results can be shown. The Pan-American will be the first exposition able to avail itself of these results to the fullest extent, and show to the world these vehicles of transportation, which are destined to effect as radical a change as was brought about by the use of the bicycle. Our success so far has been gratifying and assures us of great success in this particular unit of our Exposition. Replies are reaching us from all directions, and while we in the letter referred to did not solicit exhibits, but asked only for 'suggestions as to a plan for display by evolutions, races, etc., nearly 75 per cent. of the responses inform us

of the desire to co-operate with us and of the determination to make the best possible exhibit. Our correspondents evince a cordial spirit, and, with hardly any exception, promise to do all in their power to aid us."

# THE ELECTRIC TRAVELING CRANE IN THE GERMAN SECTION OF THE PARIS EXPOSITION.

(Translated from "La Vie Scientifique" for Electricity.)

The first step is being taken on the Champ de Mars in Paris toward the erection of heavy electrical working machinery by the German department, and it presents an impressive picture of industrial power to strengthen her renown and in a measure to increase her industrial supremacy.

It is now well known that central stations are being erected on the Champ de Mars to supply the Exposition with electrical energy. One of these stations is situated just off La Bourdonnaise avenue, and its power will be utilized to build up the French section; the other one occupies a symmetrical position to the first station, in reference to an axial line drawn through the Champ de Mars, and will be drawn upon to supply the requirements of the foreign departments. In each division of Machinery Hall is a traveling crane to be used in the placing and erection of heavy machinery. French manufacturers furnished one of them, and the other comes from the Berlin establishment of Carl Flohr. It has been in operation for a long time, and will be employed for handling machinery in the Belgian, English and other sections. In this locality the large American companies will exhibit their principal machinery, consisting of dynamos, electric motors, lamps, air compressors, steam engines and such kindred apparatus in its multiplicity of de-

It is to be noted that the directors of the Exposition called on Germany for the transporting apparatus that is to play so important a part during the installation period, and they can be well assured that Germany will successfully meet the rigorous exigencies that are made more aggravating by strict specifications and more difficult by special local circumstances.

The German Commissioner awarded to the Flohr factory the construction of the crane in March, 1898, and the designs were immediately commenced, and none too soon, for there was no time to be lost. Their construction departments were kept very busy, and only a well organized condition of their works enabled them to satisfy their clients.

In spite of the difficulties due to a large order, and the many modifications thought necessary during the manufacture, the first machine set up in Machinery Hall was the single arch traveling crane. This crane is designed to raise a load of 25 tons to a height of 12½ meters; the width of the arch is 27 6-10 meters, which is the exact distance between the rails on which it travels. This was one of the primary conditions of construction to preserve the whole space between its vertical supports without obstruction.

The track is laid along the supporting pillars of the gallery, and consists of two Vignole rails laid side by side, leaving between them a space for the passage of the truck frames. These rails are supported on short wooden ties laid on longitudinal beams of rectangular section, made up of sheet-iron plates. The

trusses, the arch and the whole upper structure is lattice-work construction.

Up to a certain point the supports are double and branch out terminating in a platform, which rests on two strong bases, each carried by a pair of two axle trucks which travel along the rails. A double transverse footbridge binds together the spandrels of the arch, and each bridge is supported from the center of the arch by a set of connecting hangers.

An electric motor with bevel gear connections operates an endless screw which turns the axles of the trucks.

The mechanism of the traveling crane is controlled by an operator from a platform placed slightly above the floor, level with the first gallery. From this position he governs the motors of the lifting tackle by means of an electric controller, and also moves the crane along the track at a speed of half a meter per second with an expenditure of energy of 26 horse power.

To raise the maximum load at a speed of 4-100 meters per second, requires 36 horse power, while a displacement of 30-100 centimeters per second requires 8 horse power. Continuous current motors are used.

The total weight of the crane is approximately 70,000 kilograms, and the mechanical parts, including motors, etc., weigh 28,000 kilograms. Ten railway cars were required to transport the material used in the construction of this great structure.

## THE ARNOLD ELECTRIC POWER STA-TION COMPANY.

(From the Street Railway Review.)

The Arnold Electric Power Station Company of Chicago was organized in 1896 to make and sell the parts peculiar to the "Arnold System" of power station construction, and acting in this capacity it has supplied a number of plants with magnetic clutches, shafts, quills, box stands and couplings. Among these plants may be mentioned the Ft. Dodge Light & Power Company, Ft. Dodge, Ia.; Chicago Board of Trade; Englewood & Chicago Electric Railway Company (now Chicago Electric Traction Company); Land Title & Trust Building, Philadelphia; University of Michigan, Ann Arbor, and W. B. Conkey Co., Hammond, Ind.

Through natural development this company has gradually broadened the scope of its work until it is now in position to make a proposition for furnishing and erecting in place entire electrical properties, and it already has an enviable record along this line.

The Chicago & Milwaukee Electric Railway was designed and built complete, exclusive of track and rolling stock, by the Arnold Company. This is the first long distance electric road comprising a central steam station containing direct current generators for supplying one section of the line, and alternators generating current at high potential for transmission to a number of sub-stations, each equipped with a storage battery and rotary transformers and converters.

The entire power plant and building of the Imperial Electric Light, Heat & Power Company at St. Louis, Mo., was constructed by the Arnold Company. This plant is a large central station, using 500-volt generators working in parallel with a storage battery auxiliary. By dividing this battery into two parts a distribution system was devised which allowed the use of 235-volt incandescent lamps, are lamps and power motors off the same generators—a de-



cided departure from the central station practice. This system has been adopted for another large central station since the erection of the Imperial plant.

The Arnold Company was also given the contract for the complete light, heat and power plant erected in connection with the new railroad shops of the Chicago Great Western Railroad, at Oelwein, Ia. This contract comprised not only the heating and lighting of the shop buildings, covering many acres, from a central plant, but also the application of a large number of motors for various uses. This has been the first plant to adopt the Arnold magnetic clutch for line shaft work, though these clutches have been used for some time in connection with the three way couplings, which are a part of the Arnold System of power station construction.

Another notable installation recently completed is the isolated plant for the Garrett Building, Chicago, which is occupied by a large wholesale grocery establishment. This contract included a complete system of lighting and power wiring for 45 motors, a storage battery auxiliary with booster and switchboard, and three generators connected by means of the Arnold System to two high speed engines. The plant is remarkable for the small amount of space occupied.

The position of the Arnold Company is unique among contractors; it works out the solution of the engineering problems involved in an undertaking and submits a proposal for doing the work, with guarantees as to the efficiency. Being in no way connected with any manufacturing concerns it is perfectly free to buy and use any make of apparatus which seems best adapted for the purpose.

The advent into general electrical contracting work of this company, prepared as it is with an organization capable of handling the largest contracts and willing to guarantee the operation and the economy of a completed plant or installation, is a development which promises to bring about new methods in building extensive electric properties.

### THE FIRE ALARM TELEGRAPH.

In a lecture before the Franklin Institute in Philadelphia on March 27, Mr. Adam Bosch, referring to the fire alarm telegraph, among other things said:

"Public attention to this application of the telegraph was first called on June 3, 1845, by Dr. W. F. Channing, of Boston, only a year after the completion of the first telegraph line between Baltimore and Washington. He outlined his plan of a central office system to be connected with every engine house and fire bell of the city. In every station thus established a Morse register and key in connection with an alarm bell were to convey an appropriate signal to every other station on the circuit. If so desired, every alarm of fire might be made to pass through the central office before being communicated to the different stations, The agent or operator would therefore be enabled by depressing a single key to ring out an alarm simultaneously on every church bell in the city.

"It was not until 1847 that the first practical effort was made to carry out the ideas of Dr. Channing, but three years passed before an experimental system was installed in Boston, the first in the country. Much apparatus was constructed and discarded before the big tower

bells successfully rang out the numbers of the signal boxes according to the dot and dash code. The signal boxes gave no end of trouble before they could be depended on to transmit the alarms so that they could be understood under all conditions. Serious defects were constantly developing, but progress kept pace. The first city after Boston to adopt the fire alarm telegraph was Philadelphia, where it was introduced in 1855.

"The attention of J. N. Gamewell was first directed toward the problems of the fire alarm in this same year. In 1859 the firm of Gamewell & Co. obtained control of all patents relating to the fire alarm telegraph. They gathered men of inventive genius and great mechanical skill, three of whom especially distinguished themselves by inventions of the greatest merit, Edwin Rogers, James M. Gardiner and Moses G. Crane. The first system, as a result of their work, equipped with automatic signal boxes, was introduced in 1866.

"The modern central office fire alarm system still resembles in general plan that outlined by Dr. Channing fifty-five years ago, but in instruments and apparatus most wonderful improvements have been made. There is little difference in the apparatus of recently furnished or reconstructed central office systems, and a description of one will pretty well answer for all.

"In modern systems the Morse register has been replaced by the multiple-pen register, which has the merit of greater compactness and may accommodate both the signal and alarm circuits, with the advantage that as the records are printed in parallel lines on the same paper, their relative positions will indicate to a second the time elapsed between the reception of the signal from the box and its transmission to the engine houses.

"Manual transmitters of recent make are marvels of mechanical skill. The dials are all placed on the same shaft and with these morning dials any number up to 999, and by adding another dial, up to 9999, may be transmitted. The liability of error by the operator is reduced to a minimum, and with a single movement of the starting lever from one to four 'rounds' may be transmitted, without further detention from the manipulator.

"The best practice demands that there should be two separate circuits to communicate alarms from the central office to the engine houses. The combination or joker system as adopted by nearly all the larger cities provides an additional and independent method, and as use is made of the duplex principle, there is intercommunication between the central office and engine houses. When a certain number of engine companies are away from quarters other companies are assigned to take their places and cover the district in their absence. It is therefore important that the entire department should know immediately of their return to quarters. This the returning companies do by signaling to the central office, whence the signal is transmitted without delay to the entire department. Attached to each signal box circuit is a series of switches operated by a lever by means of which the local relay of the repeater may be instantly inserted into any box circuit from which an alarm is being received. and the alarm is received also on the instruments in the engine houses. Other switches are so devised that in an emergency the alarm may be transmitted instantly and automatically on the joker circuit without the aid of an operator."

## SOCIETY NEWS.

#### Chicago Electrical Association.

The title of the paper to be read by Prof. I. J. Macomber before the Chicago Electrical Association on April 6 has been changed to "Transformer Design." The subject as originally announced was "Laboratory Methods."

#### American Institute of Electrical Engineers.

The 141st meeting of the American Institute of Electrical Engineers, was held in New York March 28th. In the absence of President Kennelly, Manager C. P. Steinmetz presided.

A paper was presented by Mr. Joseph Sachs of Hartford on "The Evolution of Safe and Accurate Fuse Protective Devices." The discussion was participated in by Messrs. G. S. Dunn, L. W. Downes, W. C. Woodward, H. C. Wirt, W. J. Hammer, F. V. Henshaw, C. O. Mailloux, Fremont Wilson and C. P. Steinmetz.

Resolutions of respect to the memory of the late S. Dana Greene adopted by the council were read by the secretary.

At the meeting of the council in the afternoon the following associate members were elected: Arthur C. Babson, Max D. Baron, Francis O. Blackwell, J. Walter Esterline, Fred. Alan Fish, Carl F. Fog, Irwin John Macomber, Harry Bowman Marsh, John Motley Morehead, James D. Mortimer, Martin Henry Offinger, Samuel W. Rushmore, Aubrey Norman Shaw, Chas. C. Stutz.

Prof. F. W. Brady of Mesilla Park, N. M., was transferred to full membership.

The following nominees were selected by council for the anual election May 15th:

For President—Carl Hering.

For Vice-President—Gano S. Dunn, Arthur V. Abbott, W. L. R. Emmet.

For Managers—W. S. Barstow, Calvin W. Rice, C. T. Hutchinson, R. D. Mershon.

For Treasurer—G. A. Hamilton.

For Secretary-R. W. Pope.

Dr. M. I. Pupin was appointed a manager to serve during the unexpired term of the late S. Dana Greene.

# LEGAL NOTES.

A short time ago the American Electrical Novelty & Mfg. Company received a favorable judgment in the suit brought by it against the Acme Electric Lamp Company. The suit was brought in equity for the infringement of certain patents, one a design patent, No. 29,939, dated January 3, 1899, and the other patent, No. 617,592, dated January 10, 1899. The design patent covered a design for a portable lamp body and the other covered an electric device for the lamp. The case was submitted to the court without argument and upon examination of the record the court held that the design patent and claims 1 and 3 of the other patent appeared to be valid and to have been infringed. The plaintiff was therefore given a decree in its favor.

Judge Budd of the Superior Court of Stockton, Cal., has handed down a decision in the suit of the Stockton Gas & Electric Company against the county of San Joaquin to recover \$1,400 paid under protest on its franchise, upon which Assessor Ortman had placed a valuation of \$115,000. The decision in effect is that the franchise is assessable in the county, where the company is granted special privileges. The contention of the company was that the principal place of business of the corporation being in San Francisco the franchise was assessable there only. In San Francisco the franchise is assessed for but \$1,000.

#### CANADIAN NOTES.

(From our Ottawa Correspondent.)

Application will be made at the present session of the Manitoba Legislature for the incorporation of the Winnipeg, Selkirk and Lake Winnipeg Electric Railway. It is proposed to run this road through to Selkirk, and possibly to Lake Winnipeg.

The introduction of the bill in the Ontario Legislature to charter an elevated street railway system for Toronto is causing a little un-easiness among holders of Toronto Electric Railway stock. The company has been organized by local capitalists, and has a capital of

The Bracebridge and Trading Lake Railway bill has successfully passed the Ontario Legislature. The company proposes to build and operate an electric railway from Bracebridge to Baysville and Beaumaris.

Advices from Niagara Falls, Ont., state that tenders have been taken for rebuilding the power house of the Niagara Falls Park and River Railway. The Sutherland Construction Company proposes commencing work at an early date to convert the horse car railway of the townin to an electric system.

Messrs, Tuerk Bros, have made an application to the town of Berlin, Ont., for a site for a factory to manufacture gasoline engines and automobiles. It is their intention to erect three large buildings for that purpose.

The proposed works of the Nickel Steel Company, of Hamilton, Ont., will consist of four blast furnaces. There will be two open-hearth buildings about 800 feet long and 80 feet wide. Electric power will be used, the machinery being operated by means of rotary converters.

All of the Eddy Company's saw mill, wood working, match-making and paper manufacturing plants, in Ottawa, will, before the close of the present year, be operated by electricity. The power will be obtained from the Conroy Milling Company, whose several mills are situated about three miles above the Eddy establishments. Construction work is now being carried on, and it is expected that fully 8,000 horse-power will be supplied to the Eddy Com-

The Cataract Power Company of Hamilton, Ont., was empowered by the Ontario Legislature, in January, 1898, to develop electric power in the vicinity of the Welland canal. The company proceeded to construct hydraulic works at Decew's Falls, and to build a transmission line to Hamilton, and the company is now supplying power to various concerns in that city. Hon, J. M. Gibson, Attorney-Genthat city. Hon. J. M. Gibson, Attorney-Ge eral of Ontario, is president of the company.

#### Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended March 24:

Aberdeen, 6 cases, \$2,225; Amsterdam, 1 case, \$17; Antwerp, 113 cases, \$13,053; Argentine Republic, 307 cases, \$27,945; Australia, 267 cases, \$13,366; Berlin, 14 cases, \$32; Brazil, 27 cases, \$1,529; British West Indies, 19 cases, \$291; Brussels, 5 cases, \$86; Bucharest, 7 cases, \$75; Central America, 54 cases, \$939; Cuba, 109 cases, \$1,330; Ecuador, 15 cases, \$358; Glasgow, 15 cases, \$3,825; Gothenburg, 8 cases, \$1,717; Hamburg, 44 cases, \$1,525; Havre, 376 cases, \$25,521; Hull, 4 cases, \$2,000, Japan, 1 case, \$200; London, 176 cases, \$9,077: Malaga, 2 cases, \$68, Manchester, 7 cases, \$121; Mexico, 159 cases, \$7,878; Rome, 14 cases, \$121; Southampton, 11 cases, \$2,620; Vienna, 2 cases, \$40.

The following were the exports for the week ended March 31:

Antwerp, 79 cases, \$4,428; Argentine Repub-

lic, 1 case, \$187; Australia, 96 cases, \$6,445; Barcelona, 2 cases, \$34; Berlin, 2 cases, \$611 Brazil, 39 cases, \$1,961; Bremen, 7 cases, \$109; British East Indies, 34 cases, \$771; British Guiana, 35 cases, \$5,075; China, 1 case, \$61; Copenhagen, 3 cases, \$78; Ecuador, 5 cases, \$50; Havre, 20 cases, \$1,000; Japan, 11 cases. \$1,651; Lisbon, 81 cases, \$3,042: Liverpool, 284 cases, \$22,171; Mexico, 26 cases, \$884; Newfoundland, 2 cases, \$89; Peru, 26 cases, \$914; Siam, 13 cases, \$285; Southampton; 12 cases, \$1,769; Stockholm, 3 cases, \$130.

#### PERSONAL MENTION.

Mr. O. H. Kirk, of the Westinghouse Electric & Manu facturing Company, has gone to Kobe, Japan, where he will represent the company in the Far East—looking particularly after Corea, Siberia, China and the Philippines.

Mr. E. F. C. Young has been elected director of the Con solidated Traction Company of Jersey City, N. J., to succeed the late Bernard M. Shanley. Mr. Young has also been appointed president of the company.

Mr. Van Dusen Rickert of Pottsville, Pa., has been elected manager and secretary of the Edison Illuminating Company of that city, and secretary of the Anthracite Light. Heat & Power Company, a corporation merged with the Edison. He succeeds Thomas Haldeman, who has accepted the management of the Columbia (Pa.) Electric Company.

Mr. C. F. Stierly has resigned his position as superintendent of the Cumberland Electric Light & Power Company of Nashville, Tenn., to accept the position of chief engineer and superintendent of the power plant of the Syracuse, N.Y., Rapid Transit Company.

Mr. Harry Pierce, president of the Fitchburg (Mass.) & Suburban Street Railway, who has been active in bringing about the combine between the Worcester & Clinton, Clinton & Hudson, Leominster & Clinton and his own road, will, it is reported, have charge of the consolidated interests as superintendent.

Mr. J. Elv of the Georgia Electric Light Company of Atlanta. Ga., has been invited to deliver a lecture under the auspices of the Electrical Workers' Union in the near future on the subject of "Electricity and Practical Electrical Appli-

### INCORPORATIONS.

The Consumers' Light, Heat & Ice Company, Newport News, Va .- to manufacture electric light and power, ice refrigeration, etc. Capital stock, \$100,000. Incorporators: W. C. Stuart, R. W. Perkins, J. A. Hirschberg, E. Peyser, A E. G. Klor, L. A. Myers, L. B. Reynolds, H. J. Lewis and F. Read, all of Newport News.

The People's Light & Power Company, East Liverpool, O. -to supply electricity for light, heat and power. Capital stock, \$25,000. Incorporators: C. A. Smith, A. G. Mason, J. A. Flood, J. E. McDonald and W. L. Smith.

The Denver Gas & Electric Company, Denver, Col.—to sup ply light, etc. Capital stock, \$3,500,000. Incorporators: G. Treadway Thompson, of Denver, and others.

The Union Electric Company, San Jose, Cal. -to build, purchase and operate all kinds of electrical plants and machinery; also to construct telephone and telegraph lines and to operate tramways. Capital stock. \$300,000 Directors: W. L. Hood, Z. L. Cornwell, F. L. Emerson, E. J. Emerson and F. F. Britton.

The Utica Electric Company, San Francisco, Cal. to manufacture all kinds of electric plants. Capital stock, \$10,000. J. V. Eichbaum, F. H. Eichbaum, J. W. Wright, H. Brooks, B. B. Rosekars, all of San Francisco

The Slayton Electric Caster Company, Tecumseh, Mich to manufacture Slayton electric casters, insoles, etc. Capital stock, \$20,000. Incorporators: D. L. Whitenack, G. Merritt, C. A. Slayton and Cynthian Slayton, all of Tecumseh.

The Electric Engine & Power Company of New York, Phoenix, Ariz. Capital stock, \$60,000,000.

The Charleston Electrical Supply Company, Charleston, W. Va. Incorporators: Edwin Polsne E. C. Polsne and E. C. Marwin, of Charleston; A. A. Atkinson and C. W. Me-Daniel, of Athens, O.

The Spring Valley Gas & Electric Company, Spring Valley, N. Y. Capital stock, \$40,000. Directors: George M. Dunlop, John D. Dunlop, of Spring Valley, and H. L. Hunt, of New York City.

The Cape Nome Electric Light & Telephone Company, San Francisco, Cal. to sell electricity, electric lights and power. Capital stock, \$150,000. Incorporators: D. Rich, E. Folger, C. S. Benedict, E. Holland, all of San Francisco, and C. S. Rosener, of Nome, Alaska.

#### ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F. street, N.W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.

#### LETTERS PATENT ISSUED MARCH 27, 1900.

#### ELECTRIC RAILWAYS AND APPLIANCES.

ELECTRIC RAILWAYS AND APPLIANCES.
645,990. Trolley-Wheel. Richard S. Windsor, Alexandria,
Va. Filed July 18, 1899.
646,155. Electrical Railway-Switch. Philip E. Perry, Boston, Mass., assignor of one-half to Randolph C. Surbridge,
Cambridge, Mass. Filed Aug. 17, 1899.
646,229. Surface Contact System of Electric Railways. Robert Lundell. New York City, assignor to the Johnson-Lundell Electric Company, same place. Filed July 12, 1899.

#### ELECTRIC LIGHTS AND APPLIANCES.

646.114. Portable Electric Lamp. Alexander F. Vetter, New York City, assignor to the United States Battery Com-pany, same place. Filed Oct. 11, 1899.

#### ELECTRICAL MACHINERY AND APPARATUS.

645.943. Dynamo-Electric Machine. Gustaf Dalen and Arthur Hultqvist. Stockholm. Sweden. Filed Oct. 5, 1899.
645.94. Electrical Switch. Julius C. Tournier, Schenec tady. N. Y., assignor to the General Electric Company of New York. Filed Sept. 25, 1899.
646.068. Electric Switch. John L. Creveling, New York City. Filed June 10, 1899.
646.092. Dynamo Electric Machine. Benjamin G. Lamme, Pittsburg. Pa., assignor to the Westinghouse Electric & Manufacturing Company of Pennsylvania. Filed June 30, 1899.

Manufacturing Company of Pennsylvania. Filed June 39, 1899.

646,119. Ammeter. Peter H. F. Spies, Yonkers, N. Y., as signor to Charles G. Durfee, same place, and Louis A. Rodenstein and Neil Ambrose Fiannery, New York City. Filed Aug. 18, 1899.

646,147. Electric Motor. Henry F. Joel, London, England. Filed Feb. 4, 1899.

646,169. Apparatus for Electrically Controlling Engines, Electromotors or Other Machinery. Wilham H. Harfield, London, England. Filed Jan. 16, 1899.

646,308. Automatic Regulator for Alternating Dynamos. George S. Neely, Pacific, Mo. Assignor of one-half to Altert Koppitz, same place. Filed June 7, 1898.

646,309. Induction-Motor. George S. Neeley, Ferguson, Mo. assignor of one-half to Altert Koppitz, Pacific, Mo. Original application filed June 7, 1898. Divided and this application filed Nov. 18, 1899.

## TELEPHONES AND TELEPHONE APPARATUS.

 645,933. Telephone. Michael Beck and Emil Ferrant, Minnapolis, Minn. Filed July 18, 1899.
 645,058. Telephone System, Albert K. Keller, Philadelphia, Pa. assignor to the International Telephone & Switchboard Manufacturing Company, Plainfield, N. J. Filed Feb. 6 1889. Feb

Telephone-Receiver. Albert K. Keller, Philadelphia, assignor to the International Telephone & Switch-assignor to the International Telephone & I. Filed l Telephone & Switch-Plainfield, N. J. Filed

Pa., assignor to the International Telephone & Switchboard Manufacturing Company, Plainfield, N. J. Filed Feb. 6, 1899. Renewed Oct. 11, 1899.

[360. Telephone Transmitter, Albert K. Keller, New York City, assignor to the International Telephone and Switchboard Manufacturing Company, Plainfield, N. J.

Switchboard Manufacturing Company, Plainfield, N. J. Filed Nov. 28, 1899. 646,121. Duplex Multiple Metallic Telephone System. Fred C. Hughes, Detroit, Mich. Filed Jan. 29, 1898. 646,124. Combined Telephone and Vending Machine. Charles H. Kraft, Salt Lake City, Utah. Filed Sept. 23, 1899.

#### MISCELLANEOUS.

MISCELLANEOUS.

645,978. Secondary Battery. William L. Silvey, Dayton. Ohio. Filed Nov. 20, 1899.

645,992. Primary Battery. Francis B. Badt, Chicago, Ill., Filed April 4, 1898.

646,011. Elevator. Charles A. Harkness, Providence, R. I. Filed Feb. 23, 1897.

646,020. Device for Electrical Connections. Mathias Pfatischer, Philadelphia, Pa. Filed Nov. 24, 1899.

646,041. Phonograph. Philipp von Wouwermans, Vienna, Austria-Hungary, assignor of nineteen twenty fifths to Theodor Fischer, Max Raphael Kaldegg and Ignace Pulay, same place. Filed Sept. 25, 1897.

646,046. Electric Time-Alarm. Hans Reich, Bozen, Austria-Hungary. Filed Oct. 14, 1898.

646,100. Thermostat. Charles B. Rogers, Stevenson, Md. Filed Oct. 28, 1899.

646,150. Electrical Connector. John Langton, New York City. Filed June 21, 1899.

646,150. Electrical Connector. John Langton, New York City. Filed June 21, 1899.

646,150. Electrical Connector. John Langton, New York City. Filed Sept. 7, 1899.

646,150. Electrical Boll. Francis Keil and Henry F. Keil, New York City. Filed Sept. 7, 1899.

646,352. Vessel Indicator. Arthur L. McCormick, Port Huron, Mich., assignor to Byron J. McCornick, Fint. Mich. Filed Feb. 15, 1897.

646,325. Battery Jar or Receptacle. Elmer A Sperry, Cleveland, O. Filed April 22, 1899.

646,318. Secondary Battery. Henry Blumenberg, Jr., and Frederick C. Overbury, New York City. Filed Dec. 1, 1898.

#### REISSUE.

814. Car-Fender. Reginald Forwood, Paris, Tex. Fi Feb. 17, 1900. Original No. 631,933, dated Aug. 29, 1809



# GENERAL NEWS.

What is Going On in the Electrical World.

#### LIGHTING.

Arlington, Minn.—This village will erect a new electric light plant this summer.

Blanchard, Ia. - This town will erect an electric

Casper, Wyo.—An electric light plant will soon be built by this city.

Ceresco, Mich.—The Kalamazoo Valley Power Com-pany will erect an electric light plant at this place.

Cooper, Tex.—The city council has granted a franchise for the construction of an electric light plant.

Downsville, N. Y.—This town is to have electric light in the near future.

East Grand Forks, Minn.—This city expects to build an electric light plant this summer, and will soon take steps toward securing money, etc. Address J. T. Brandt.

Eastman, Ga.—This city has voted an issuance of \$15,000 in bonds for the construction of an electric light plant and water works.

Fairport, N. Y.—Chas. H. Howe, ex-president can be addressed in regard to an electric light plant that the village board contemplates erecting in the near future.

Georgetown, O -The citizens are agitating the question of erecting an electric light plant.

Hailey, Idaho.—The water power of the Wood River to be utilized to build an electric light plant here this spring.

Hillsboro, N. D -The Bismarck electric light plant is to be enlarged to double its present capacity

Howell, Mich.—This city will bond itself for \$15,000 for a municipal electric lighting plant.

Idaho Falls, Idaho.—This town proposes to issue bonds to build an electric light plant.

Laurens, S. C.—The owners of the Ware Shoals, 15 miles west of here, are considering a proposition for the erection of an electric light plant.

Marion, Ind.—Plans have been prepared for a new electric light plant in this city to cost \$100,000.

McGrawville, N. Y.—At the recent village election the proposition to light the streets by electricity was carried by a majority.

Newfane, N. Y.—The Lockport felt mill, located here, expects to put an electric lighting plant in their establishment.

New London, Wis.—Chicago promoters are trying to terest the people here in a plan for a new electric interest the light plant.

Odessa, Mo.—This town is negotiating for an electric light plant.

Osgood, Ind.—T in electric lights. -The town council has decided to put

Rockville Centre, N. Y .- It has been voted to approriate \$16,500 for increasing the electric light plant at this place.

Spencerville, O.—This town will issue \$16,000 in bonds for the erection of an electric light plant.

Stafford, Kan .- The citizens of this place are agitating the question of erecting an electric light plant.

Troy, Ill.—The citizens of this place are agitating the question of erecting an electric light plant. Wampsville, N. Y.-J. W. Warner is about to erect

an electric light plant.

Williamsburg, Va.—The authorities of William and Mary College of this place will use electric lights in the college buildings, and about the grounds, and also put ater plant for fire and general use.

Woodhull, Ill —The citizens are discussing the proposition of erecting an electric light plant.

#### STREET RAILWAYS.

Albany, N. Y.—C. W. Blakeslee & Sons of New Haven, Conn., have been awarded the contract for the building of a 35 mile third rail system between Hudson and this city. The work is to be finished by the middle of summer. The electricity will be generated by a water power plant at Stuyvesant, N. Y., and the road will run through Niversville, N. Y., where it will intersect with the Boston & Albany, and will be a powerful competitor for the big business done by the New York Central between Hudson and Albary.

Bucyrus, O.—The Ohio Central Traction Company has decided to extend the electric line from this place to Upper Sandusky by way of Nevada and from Galion to Crestline.

Columbus, O.—The Chillicothe, Mt. Sterling & Columbus Electric Bailroad Company recently filed an ordinance with the city clerk for a franchise over Rich, Town, Scioto, McDowell and Mound streets, Jackson pike and a part of the Scioto levee.

Durham, N. C.-Stock has been subscribed to a company with strong backing for the establishment of a trolley line between this place and Chapel Hill.

Hoquiam, Wash.—Rapid steps have been taken to the furthering of the project of building an electric

ar line to connect Aberdeen and this place, a distance of four miles.

Laurens, N. Y .- The Oneonta Electric road will be extended to this place, and used for the transportation of milk

Marshalltown, Ia.—C. C. St. Clair of this city, with capitalists of Columbus, O., is interested in the building of a new electric street railway from Allison to this city by way of Parkersburg, Grundy Center and

Medford Mass -The Roston Elevated Railroad Company has obtained the necessary charters from this city and Somerville, so the long expected electric road past Tufts College is at last assured.

Minneapolis, Minn.-It is rumored that Lake Minnetonka is to have an electric line connecting it with this

Nashville, Tenn.—The People's Electric Railway Company has been formed to build an electric line in this city and suburbs. The company proposes to construct about 48 miles of track.

Owosso, Mich.—A twenty year franchise has been granted to J. T. McCurdy giving him the right to acquire, construct, maintain and operate an electric railway within the limits of this city.

Philadelphia, Pa.—Capitalists of this city contemplate the building of an electric railway from Carbondale to Susquehanna, a distance of thirty miles.

Shelburne, Vt.—Gen. Robert Avery, vice-president of the Burlington & Hinesburg Railroad says that the South Burlington & Shelburne electric road will surely be built this season and that its construction will be begun as soon as possible.

Seattle, Wash.—The city council has granted a franchise to the Frink syndicate to build an electric railway from the intersection of Connecticut street to the City Park. W. H. Park is interested.

Toledo, O.—The Toledo & Michigan Railway Company has been incorporated to build an electric railway from this city to the Michigan State line, where it will connect with the Toledo & Monroe Railway Company's line now being built. Surveys have been made for the new company's line and construction will soon be started. H. E. King, W. H. Spalding and H. W. Lloyd are interested.

Whitehall, N. Y.—The village trustees have granted a franchise to the Whitehall & Granville electric rail-road, and the construction of the road will be begun at

#### COMPANY MATTERS.

Biddeford, Me.-The members of the Portland syndicate, which recently purchased a controlling interest in the Biddeford & Saco Electric Railroad have decided to enlarge and improve the electric railway plant.

Bridgeport, Conn.—A preject is afoot for uniting the trolley roads centering in this city, including the Shelton Street Kailroad line reaching to Ansonia, Derby and Shelton, so that they may deliver freight at a Bridgeport wharf for transportation to New York by a new freight steamboat line.

Butler, Mo.—It is stated that a company expects to build an electric light, ice and heating plant, and a Cleveland, O.—The National Carbon Company has

Cleveland, O.—The National Carbon Company has decided upon extensive improvements to the principal plant in this city.—It is probable that the Cleveland & Eastern and the Cleveland & Chagrin Falls electric railways will be consolidated this spring.—The Little Consolidated Street Railway Company, which operates electric and cable lines in this city, is making arrangements to change the motive power on the latter to electricity

Flushing, N. Y.—The New York and Queens Gas & Electric Company contemplates making extensive improvements to its plant in Lawrence street, and the board of directors has authorized the expenditure of \$31,000 for this purpose.

Granville, N. Y.—The Granville Electric Light & Power Company has decided to enlarge the power house, add an extra boiler, and put in another 300 horse power engine

Henderson, Ky.—The Henderson Street Railway Company will reorganize, and enlarge and improve its power plant adding new rolling stock, motors, etc.

Houghton, Mich.—The Peninsula Electric Light & Power Company has voted to increase its capital stock to \$390,000 to add to its equipment.

Milwaukee, Wis.-The Milwaukee Electric Railway

Milwaukee, Wis.—The Milwaukee Electric Railway & Light Company has placed an order through the Milwaukee Rice Machinery Company of this city for a large quantity of heavy machinery, for use in its construction and repair department.

New Castle, Del —Clarence T. King, of Philadelphia, secretary of the Wilmington & New Castle Electric Railway Company, has secured the contract for the lighting of this city for five years for thirty are lights of 2,000 candle power at \$68 each per year.

Pittshurg Pa.—The Allegheny Valley Railroad Com-

Pittsburg, Pa.—The Allegheny Valley Railroad Company will erect a power plant at 20th street and the Allegheny Valley Railroad in the 12th ward.

Reading, Pa.-The Metropolitan Electric Light Company contemplates a number of important improve-ments at its plant on South 7th street. Among these will be the installation of two 500-horse power boilers,

directly in the rear of the present power house, the introduction of new machinery, a place for storing coal, etc. These improvements will entail a large expenditure of money.

Schenectady, N. Y.-The Utica Electric Light & Power Company is about to bring power from Trenton Falls for manufacturing purposes.

Shamokin, Pa.—The Shamokin Heat, Light & Power Company has definitely decided to erect a large building for the accommodation of all the electrical machinery now in the several electric light stations in this city, and work on same is expected to be started soon.

Stamford, Conn.—The National Electric Company of this place has filed in the State Secretary's office a certificate of dissolution.

St. Louis, Mo.—The Imperial Electric Light, Heat & Power Company has increased its capital stock to \$1,500,000 to construct a large power plant. C. Boettcher is president.

Troy, N. Y.—The Ham Sand Box Company of this city has received a large order for sand boxes from the Electric Railway & Tramway Carriage Works of Preston, England.—The plant of the Ballston Spa Light & Power Company, comprising an electric station and gas works, has lately been sold to the Hudson River Power & Transmission Company.

#### MANUFACTURING.

Cleveland, O.—Electric specialties are manufactured by a new firm in this city, designated as the American Electric Company.

Indianapolis, Ind .- The Wilson Manufacturing Company of St. Louis will remove to this city. The plant is large and manufactures bells of every descrip-tion. The Chenowith Light & Power Company will furnish the buildings, power, light, heat and water.

furnish the buildings, power, light, heat and water.

Menomonie, Wis.—The Submerged Electric Motor
Company has been organized in this city. This company is the owner of the Submerged Electric motor, a
recent invention of I. N. Smith of Minneapolis and
Tracy B. Hatch of Chicago. This device is not only an
invention, but also a discovery, and offers the first
solution of the problem of successfully operating an
electric motor under water, and will be manufactured
by the company. by the company.

by the company.

New York.—It is reported that some of the electric light companies in the larger Eastern cities have a new scheme they are going to try this summer. During the months when fewer lights are used the electric plants will be employed in the manufacture of ice.—The Baldwin & Rowland Switch Company of this city is about to begin the manufacture of electric switches.

Trenton, N. J.—A company has been formed here with a capital of \$3 500,000, known as the Hanscom & Hough Storage Battery Company, for the purpose of manufacturing electric motors, batteries and dynamos.

manufacturing electric motors, batteries and dynamos. Westerly, R. I.—The Jackson & Sharp Company has recently constructed three double decker trolley cars for the Syracuse, Lakeside and Baldwinsville Railway Company, on the plan of the regular summer cars with rows of seats on the top of the car. The company also has a number of trolley cars about completed for the Rochester and Sodus Bay Railway Company and the Sanford and Cape Porpoise Railway Company. A number of double decker closed trolley cars for a Paris company are now in process of construction. company are now in process of construction.

# POWER AND TRANSMISSION PLANTS.

San Andreas, Cal.—The Standard Electric Company has a force of 400 men at work at Whites Bar, on the Mokelumne River, where the new power plant of that company will be located. This is the largest electrical scheme in the State at present. The power will be transmitted hence to San Francisco by way of Stockton and Niles and the Santa Clara Valley towns.

Winsted, Conn.—The Winsted Gas Company has purchased of the heirs of Joseph Gould the water privileges and about 20 acres of land along what is known as Sandy Brook in Robertsville. This practically completes the purchase of various water privileges which the company has had in view for several months with the idea of establishing a large electrical power plant in Robertsville. in Robertsville.

#### MINES.

Penn, Pa.—The work on repairing and rehabilitating the mines at this place is going on daily. The works, both inside and out, so far as possible, will be run by electricity and consequently a large electric plant will be erected at this point.

#### AUTOMOBILES.

Hartford City, Ind.—Local and Omaha capitalists are backing an enterprise and propose to locate an automobile factory in this city. The free site and free fuel proposition by the city is an inducement and a large building will be elected at once.

Kokomo, Ind.—The delegates to the State Convention of the Travelers' Protective Association to be held at Terre Haute, April 20, from this city will make the journey from here in automobiles furnished by the Haynes & Appery factory.



# THE TELEPHONE WORLD.

# Meeting of Bell Telephone Company Stockholders.

At the annual meeting of the American Bell Telephone Company held in Boston on March 27, the recommendation of the directors that the property of the company be transferred to the American Telephone & Telegraph Company was approved. The stockholders also ratified the proposed exchange of shares of the company for those of the American Telephone & Telegraph Company at the rate of one share of Bell Company for two of those of the American Telephone & Telegraph Company. The retiring board was re-elected.

Before taking the vote President Hudson said that the only assets of the American Bell Telephone Company were its stock, and that its indebtedness consisted of \$10,000,000 outstanding bonds. It was thought desirable to allow this stock to remain in the hands of the Bell Company. This would be in the nature of a trust fund to be used in earing for the indebtedness when it matured. This would leave in the treasury approximately 520,000 shares of stock.

The annual report for the year ending on December 31 showed that the gross earnings from all sources amounted to \$5,760,105, an increase of \$311,407 over the gross earnings of 1898. The expenses aggregate \$1,687,154 an increase of \$632,422. The net earnings were \$4,072,451., a decrease of \$321,015.

The report continues as follows:

"The increase, in number of subscribers more than doubled that of any previous year. More than 115,000 miles of toll-line wire were added, the large proportion being of copper, and upward of 240,000 miles of exchange conductors more than half of which were placed underground.

"The new construction completed in 1839 by companies operating under Bell Telephone licenses amounted to \$24,056,822. In addition, \$2.066.311 was invested in real estate to be utilized for exchanges and company offices.

A dispatch from Dover, Del., to the N. Y. "Commercial" states that the dissatisfaction in various towns in Kent and Sussex counties, of Delaware, in reference to the "toll" system, which the Diamond State Telephone Company has ordered to be collected from renters and users of its phones has culminated in the proposal to organize a new telephone company for the better accommodation of the people in the two lower counties of Delaware. It developed in Dover recently that the organizing of a new company will be effected in a few days, as soon as a canvass is made among some prominent capitalists who favor the new move and a suffi-cient amount of money is subscribed to commence the work on the proposed line. The subscribers of the Diamond State Telephone are not allowed to talk out of the precincts of the town, not even a distance of three miles, without paying a toll of from 10 to 40 cents, in consequence of which a service is demanded to reach the entire length of the State, both north and south, without any increase over the amount charged for the yearly rental of the 'phone, which at present

One of the best indications of the material advancement of Kansas is the development of the telephone industry in that State. There has been no great stir about the movement, nothing has been said about a "boom," and yet the Kansas town of 1,500 inhabitants without a telephone exchange is the exception and not the rule. Within the past year or two dozens of Kansas towns have organized local companies, purchased their own instruments, and have established home exchanges. This is how it is accomplished: The people of a town feel the need of a telephone system; they organize a company among themselves and raise from \$1,500 to \$5,000 with which to build the plant: they operate it themselves and put the profits into extending the system; they wish to talk to the next town, and a toll line is built: that town in turn builds on to the next, and the result is that within a short time an extensive toll line system is in operation.

Charles H. Tuthill, of Washingtonville, N. Y., has been appointed general superintendent of the Highland, N. Y., Telephone Company, the concern that is preparing to construct a telephone system in Highland to connect with their other line, which will extend to nearly every village and city in, Orange County. The company has already over twenty miles of wire in operation, and expects to have the entire line in working order within the year.

Marion County, Kan., is being rapidly equipped with one of the best telephone systems in the central West. The Marion exchange already has 106 'phones, and the number is steadily increasing, while 84 'phones are now in use at Peabody. An exchange will be put in at Florence this spring, and the work of connecting all the smaller towns in the north and west portions of the county will be started at once.

 ${\bf A}$  company to construct and operate a telephone system in Clear Lake, S. D., is now organizing.

#### An Independent Association for Wisconsin.

At a meeting of independent telephone companies held at Weyauwega, Wis., on the 21st ult., it was decided to organize a State association and operate all the toll lines under one system. At the meeting 1,800 miles of toll line and 5,200 subscribers were represented. The following 16 companies are in the association: Rock County Telephone Company, Farron County Telephone Company, Jefferson Telephone Company, La Crosse & Southeastern Telephone Company, Monroe Telephone Company, Colma Telephone Company, Portage Telephone Company, Wood County Telephone Company, Marshfield Telephone Company, Wolf River Telephone Company, Dane County Telephone Company, Little Wolf River Telephone Company, The association is a combination against the American Company in the State of Wisconsin.

### A Farmers' Telephone Organization.

Fifty farmers of Clinton County, Ind., have organized a telephone company. Twenty miles of wire will be strung, connected with seventy-five homes. There will be no profit to the company, each member contributing annually for its support.

A unique plan has lately been projected, says the New Orleans "Picayune," for the establishment of a line of telephone wires extending out into the ocean from nearby points on the Atlantic coast, and so arranged that they can easily be found and used by navigators who are fog-bound or are otherwise prevented from making their way toward the harbor. The magnitude of such a scheme or the many advantages that it offers can only be fully appreciated by those whose experience has placed them in some such position as that which these wires are supposed to remedy. At certain seasons of the year fogs are of frequent occurrence along the Atlantic coast, and there is scarcely a time when they are not more or less in evidence.

Within the next few weeks plans will have been formulated whereby Frederick, Md., will be relieved of her network of overhead telephone wires. The Frederick County Telephone Company, which is a local corporation, has completed arrangements to install a new 500-drop switchboard for metallic circuits, and will commence work on its alterations this week, having secured quarters in the First National Bank Building. It will replace its wires in the city with coper wires, which will be run in cables to the edge of the city. The iron wires will all be taken down and used in the country to extend its lines in the northern section of the county, which is now practically without telephonic connections. Metallic circuits will be given to the subscribers instead of grounded ones, which render conversations much plainer and more satisfactory.

The Pittsburg & Allegheny Telephone Company will this month ask for a franchise in McKeesport, Pa. An ordinance will be presented in councils asking for right of way. It is said the company will offer to place its wires underground and fix a maximum rate of \$36 per year for telephones. It is said the company will also ask the right of way in Duquesne.

The Spottsylvania Telephone Company is rapidly extending its lines from Richmond, Va., towards Massaponax and it is thought that telephonic communication will be established between those two places and Fredericksburg and Sunlight this week.

The council of Bristol, Pa., has granted a franchise to the Central Telephone Company, recently incorporated under the laws of Delaware, and supposed to be a rival of the Bell system. The company purposes to build a long distance coast service from Washington to New York.

A San Francisco, Cal., daily states that the party line system of telephonic communication in that city will probably be done away with at an early date by the Pacific Telephone & Telegraph Company, owing to the general dissatisfaction of the public.

The Cumberland Telephone Company has made a reduction in their rates from Lynnville. Tenn., to Lewisburg, Columbia, Pulaski, Culleoka, Mt. Pleasant, Mooresville and to all the smaller places in Giles County. The patrons are said to be highly pleased with the change.

The Paterson, Passaic & Suburban Telephone Company has completed its trunk line connecting Clifton, Passaic and Garfield with Paterson, N. J. The trunk lines to North Paterson, Ridgewood and other points north are nearly completed.

It is reported that the Sunset Telephone Company will build a line connecting Lakeview, Ore., with Alturas, Cal.

#### To Test City's Rights.

The Iowa Telephone Company has thrown down the gauntlet, and a legal battle between that corporation and Iowa Falls, Ia., is on. For a year or more past the city and company have been at a variance as to the legal right of the company in the streets and alleys of the city The trouble is the outgrowth of the council seeking to tax the company or make it pay a rental for the use of the streets. The company has refused to meet any such demands upon it, and the council revoked the permit by which the company was first allowed to enter upon the rublic avenues of the corporation, leaving, as the city claims, the company without any legal right in the city. Efforts on the part of the company to set poles and string new lines have met with a refusal on the part of the city to permit any such extensions of the plant. Conferences and propositions have been made by both sides from time to time, but without arriving at any definite agreement. The upshot of the matter is that the company, through its attorney, has just served notice on the city that an injunction will be asked restraining the city from interfering with the company's extension of its lines in the city. By an agreement with City Solicitor Hutchinson, the matter will be argued before Judge Weaver and adjusted.

#### Telephones for Third Rail.

A telephone line for third-rail use has been placed in operation between Bristol and Hartford, Conn. At the terminals, New Britain and each of the passing sidings is located an instrument. Hereafter cars will wait on switches for passing cars unless released by a telephone order. The old plan of having cars proceed after a lapse of fize minutes has been abolished.

Telephone service has been promised by the Colorado Telephone Company to a number of small Colorado towns, and the first steps toward the establishment of through lines from Denver to these points have been taken. Two districts of Colorado will be given local service, including the towns of Silverton, Ouray and Delta, and the other including Sterling, Brush and Fort Morgan. As soon as material can be purchased the company will begin immediately to put in exchanges.

The Massachusetts Telephone & Telegraph Company has secured the rights of way from the Western Union Telegraph Company to run wires on its poles between Boston, Mass., and Portland. Me., for long-distance telephone service.

The Bell Telephone Company and the Enterprise Telephone Company are now engaged in making preparations to string wires through Sea Isle City, N. J.

It is rumored that negotiations are pending for the consolidation of the Cleveland and Cuyahoga telephone companies, the two corporations operating lines in Cleveland, O.

A bill was recently introduced into Congress authorizing the Postmaster-General to fix the rates on telephones used by the Government.

# TELEPHONE INCORPORATIONS.

The Phoebus Telephone Company, Phoebus, Va. Capital stock, \$10,000. Incorporators: A. M. Hanger, A. Heinckel, both of Phoebus; W. J. A. Cumming, J. V. Bickford, J. W. Lee, all of Hampton.

The Charleston & Sissonsville Telephone Company, Charleston, W. Va. Capital stock, \$1,200. Incorporators: Peter Silman, Edwin M. Keatley, Wyatt Mergan, J. H. Thompson, A. J. Spradling and P. S. Shirkey, all of Charleston.

The Regel Electric Company, Kittery, Me.—to manufacture telephone instruments and operate telephone lines, Capital stock, \$50,000. Incorporators: George B, Perkins and William Mitchell.

The American Multiplex Telephone, Telegraph & Cable Company of Massachusetts, incorporated at Dover, Del. Capital stock, \$1.000.000. Incorporators: George N. Phelps, Brookline, Mass.: Clinton E Dolbear, Hyde Park, Mass.; Martin E. Smith, Wilmington, Del.

The Farmers' Mutual Telephone Company, Cherry Flats, Pa. -to construct and operate telephone lines. Capital stock, \$5.000. Incorporators: T. J. Davies, E. C. Howell, E. D. Evans, E. C. Close, F. Peake and R. W. Bailey.

The West Alexandria Telephone Company of West Alexandria, O. Capital stock, \$3,000. Incorporators: J. E. Davis, W. H. Brubakes, G. W. Ehles, O. E. Dyer, J. Winkleman.

The Ozark Telephone Company, Cedar Rapids, Iowa. Capital stock. \$30,000. Incorporators: D. E. Howell, C. L. Konvalinka, J. T. Crimmins, all of Cedar Rapids.



## **ECTRICAL** ECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electricity from a variety of sources The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gcn., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mkg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

PASSE	N	GER R	AILW	AYS.			PASSENGER RAILWAYS.						
_		Capital	Stock.	Data and Data at	ĺ				Capital	Stock.			
FAICE.	Par	Authorz'd	Issued.	Rate and Date of Last Div.	Bld.	Asked.	name.	Par	Authorz'd Issued.		Bate and Date of Last Div.	Bid.	Anked
Albany, N Y ≺ 2. United Traction (Consolidation of the Albany and	100	2,000,000	\$1,750,000	1½ % Q., Nov. '98	. 128	124	Hartford Conn Apr 2: Hartford Street Ry. Co		\$4,000,000 1,000,000	\$200,000 247,000	8 % 8., Oct., '98.	150	=
Troy City Railway.)			ļ				Holyoke Mass.—Apr 2 Holyoke Street By. Co	100	400,000	400,000	8 % A., June, '98.	2073	212
Allentown Pa-Apr 2							Hoboken, N. JApr 2						
Alientown & Lehigh Val. Trac Oc.		4,000,000	1,500,000	••••••		15	North Hudson Co. (N. J.) Ry. Co	25	1,250,000	1,000,000	8 %, 1892.	150	-
Bridgepoi t, Conn-Apr 2: Bridgeport Traction (co	100	2,000,000	2,000,000	1 % Aug., '98	105		Indianapolis, Ind-Apr 2.		5,000,000	5,000,000	**********	24	28
Baltimore "MdApr 2 a United Rail ways & Elec. Cocom.	50	24,000,000	18,000,000	••••••	16½	1634	Lancaster, Pa.—Apr 2 Pennsylvania Traction Co Lancaster & Cel. Electric By	100	10,000,000	9,900,000 <b>87</b> ,500			=
Boston, Mass Apr 2 Now England Street Ry	100 100 50	1,000,000 2,000,000 10,000,000	4,000,000 2,000,000 9,085,000 6,400,000	1 % Q., Jan.15, '97 6 % S., A. & O. 3% % S., Oct., '98. 4 % S., Jan. 2, '99. 2% % Aug. 98,	15   85	16 87 13 114 1.0	Louisville Ry	100	4,000,000	8,500,000 2,500,000	1½ %., April '98. 2½ % S., Oct. 1, '98.		111
Brooklyn N. Y Apr 2 Brooklyn Oity Ry	100	2,000,000 43,000,000	43,000,000		231 68 <sup>1</sup> /		Twin City Rapid Transitcom Twin City Rapid Transit? % pfd. MontPeal, Canada.—Apr 2.			1,712,200	15/4 %, Oct., '98.	136	187
cBrooklyn Heights Raiiroad  *dBrooklyn City RRguar cBrooklyn, Queens Co. & Sub. RB. Coney Island & Brooklyn RB	100	12,000,000 2,000,000	12,000,000 2,000,000		107 257 325	109 289 330	Montreal Street Ry. Co	100			8 % S., M. & N. 1% % S., J. & J.	2595 100	300 100½
Kings County Elevated	100	4,750,000 4,500,000 6,000,000	4,750,000 4,500,000 6,000,000	1 % July 26, '97	75	: £0	Memphis Street Railway Co	100	500,000	500,000	***************************************	25	-
diantic Avenue RailroadgBrooklyn, B. & W. E. Railroad  Buffalo N. Y.—Apr 2:					::	::	Fair Haven & Westville RR	. 100	1,250,000 700,000	1,000,000 800,000		39	41
Buffalo & Niagara Falis Elec. Ry  *Buffalo Railway Co		1,250,000 6,000,000		1 % Q. Dec., '98.	74 100	75 103	Winchester Avenue RR	25	1,000,000	600,000	•••••••••	15	46
Columbus OApr 2 Columbus Street Railroad Columbus Stree Railroad, pfd	100		8,000,000	1 % Q., Feb., '99.	24 × 84 ×		Canal & Claiborne RR. Co	100	1,200,000	1,200,000	4 % S., July, '98. 1% % Q., Oct., 98.	1485 25 101	158 26 9
Charleston, S. CApr 2 Charleston City Ry. Co	50			8 % B.	-:		aCrescent City BR. guar. bNew Or. City & Lake BR. guar. Orleans Railroad. St. Charles Street Railway.	100 100 50	2,000,000 2,000,000 500,000	2,000,000 2,000,000	8 % S., Jan., '99. 4 % S., Jan., '99. 1 % %., June, '94. 1 % %. Oct., '98.	201/4	52
Chicago, Ill.—Apr 2 Chicago City Ry. Co	100 100 100 100 100 100 100	10,823,800 10,000,000 15,000,000 15,000,000 10,000,000 2,000,000 2,000,000 1,250,000	10,828,800 10,000,000 7,600,000 9,000,000 6,600,000 249,900 1,608,200 18,189,000 624,900	Feb 28 1900.  8 % Q., Jan., 99.  11/4 % Q., Feb. 99.	9 27 717 221	278 91/4 28 78 225  85 1101/4	New York—Apr 2: Central Crosstown RR. o'Christopher'& 10th Sts. RR. guar Dry Dock, E. Brdw'y & Battery RR. dMetropolitan Street Ry. Co. «Bleecker St. & Fulton Fy. Ry. guar fBroadway & Seventh Ave guar gCen. Park, N. &E. Rivers RR. guar AEighth Avenue RR. 412d St. & Grand St. Ferry RR. guar fNinth Avenue RR. ESIXth Avenue RR. guar Twenty-third St. R. R. Co. guar	100 100 100 100 100 100 100 100	2,100,000 1,800,000 1,000,000 750,000 800,000	600,000 650,000 1,200,000 45,000,000 900,000 1,800,000 748,000 800,000	2½ % Q. 2 % Q., Oct., '98. 1½ % Q., Nov., 98. 2½ % Q., Feb., 1900. ½ % A., July, '98. 2½ % Q.	23J 195 895 395 198	300 185 125 1625 36 240 40 410 205 2.0 410
Cincinnati, Ohio Apr 2.  Oincinnati Inc. Plane Byom. Oincinnati Inc. Plane Rypfd. Oincinnati, Newport & Oov. 8t. Ry. IOincinnati Street Ry. Co Mt. Adams & Eden Park Inc. Ry.	56 56 100 56	1,000,000 150,000 4,000,000 18,000,000	575,000 150,000 8,500,000 14,000,000 2,200,000	% % Feb., '99. 2% % Feb., '98. 1% % Q., Jan., '98 1% % Q., Jan., '98.	83 1243	89 123	Second Avenue RR. Third Avenue RR. m424 St., Manhatvile & St.Nich.Av *Union (Huckl-berry) Ry. Newark N. J.—Apr 2: Consolidated Traction Co. of N. J.	100	9 5000 0000	2,500,000 2,000,000	*******************************	199 1033, £0 190	200
Cleveland, Ohio Apr 2 Agron, Bed. & Olev. Elec. By Gleveland City By Cleveland Electric By	100	1,000,000	1,000,000 7,600,000	34 % Jan., '98 3-5 % Jan. '99, 34 % Q., Oct., '98.	48 102 87	50 108 83	North Jersey Street Railway Co. United Electric Co. of New Jersey Pittaburg, Pa.—Apr 2. Allegheny Traction Co	100 100	6,000,000 504,000	6,000,000 <b>504,00</b> 0	11 <b>% % A</b> .	26 23	27 25 56
Detroit, Mich.—Apr 2 Detroit Citizens' Street Ry Ft. Wayne & Belle Isle Ry Rapid Railway Oo Detroit Electric Railway Wyandotte & Detroit River Ry	100	2,000,000 250,000 1,000,000	1,250,000 1,200,000 250,000 1,000,000	••••••••	1003- 175 90 	i00 i10	oConsolidated Traction Cocom. Consolidated Traction Copfd. pCentral Traction Co qCitizens' Traction Co rDuquesne Traction Co sPitisburg Traction Co Fedoral St. & Pleasant Valley Ry	50 50 50 50 50 50	15,000,000 15,000,000 1,500,000 8,000,000 8,000,000 2,500,000	15,000,000 15,000,000 1900,000 18,000,000 18,000,000 1,900,000	2 %, Jan., '96. 3 %, Nov. '98. 1 %, Nov. 7, '98. 6 % A. 8 % A. Nov. 7, '98. 2 %, July, '96. 2 %, Aug., '95. 1 %, Oct. '98. 5 % A., June 80, 98, J. & J.	27 65 69 10 	273 66) 70 71
Dayton O.—Awr 2 Oity Railway Co	10	1,500,000	1,470,600	1338	140 170 114	145 1ii	Pgh., Allegheny & Man. Trac. Co P'tisourg & Birmingham Trac. Ry Pitisburg & West End Ry United Traction Cocom United Traction Copref.	50 25 50 50	8,000,000 8,000,000 1,500,000 17,000,000 8,000,000	12,994,889 8,000,000 1,500,000 17,000 000	2%, Aug., '96, 1%, Oct. '98, 5% A., June 80, 98, J. & J.	41 12 5034	423 18

Unlisted. † Full paid. | Outstanding. † Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Ratiroad at 8 % on stock and interest on bonds.

d Operating the former Mes. Trac. system, that corporation having become extinct.

c Leased to Zid Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Ry.

f Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1895, at \$215,000 per annum.

i Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1895, at \$215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on table to Wetropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 13 % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleginy, Cent., Citizens' Duqueene, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 6 % on \$3,000,000 capital stock.

r Leased to Consolidated Traction Company for 6 % on capital stock.

s Leased to Consolidated Traction Company for 6 % on capital stock.

#### TELEPHONE AND TELEGRAPH COS. PASSENGER RAILWAYS. Capital Stock. Capital Stock. Bate and Date of Last Div. Bate and Date of NAME. Par Authorz'di Issued. Last Div Eld. Asked. NAME. Par Authorz'd | Issued. Bid. Asked. New Bedford Mass-Apr 2 Boston, Mass.-Apr 2 American Bell Telephone Co.... Erie Telegraph & Telephone Co... New England Telephone Co.... 50,000,000 28,650,000 4½ % Q., Jan. '99. 810 311 1% Q., Feb. 20, '99 101½ 105,894,600 10,894,600 \$1.50 p. sh. Feb '99. 188 140 \$850,000 \$850,000 2 %, Feb. 98. 160 165 Union Street Railway Co..... 100 100 Northampton, Mass-Apr 2 Northampton Street Rv. ..... 800,00 225,000 4 % A., June '98, 170 178 New York.-Apr 2: Omaha, Neb.-Apr 2; 100 55 100 5,000,000 5,000,000 3 % A. and N. 65 100 100 100 100 110 Paterson, N. J.- Apr 2: 100 1,250,000 54 1,250,000 112 118 116 Paterson Ry. Co..... Providen (e. R. l. - Apr 2 100 8,000.000 United Traction & Electric Co .... 100 8,000,000 3/4 %, Oct. '98, 109 111 Philade | phila - Apr 2 Fairmount Park Trans. Co... \$50 pd. destouville, Man. & Fairmit. & \$ pd. destouville, Man. & Fairmit. & \$ pd. destouville, Man. & Fairmit. & \$ pd. destouville, Man. & Fairmit. & \$ pd. destouville, Man. & Fairmit. & \$ pd. destouville, Man. & Fairmit. & \$ pd. destouville, Man. & Fairmit. & \$ pd. destouville, Man. & Fairmit. & \$ pd. destouville, Man. & Suchwark Pas. R. fLehigh Avenue Ry. Co... fLombard & South Street Ry... descond & Third Streets Ry... descond & Third Streets Ry... descond & Third Streets Ry... descond & Third Streets Ry... descond & Third Streets Ry... descond & Third Streets Ry... descond & Third Streets Ry... descond & South Street Ry 170 Philade lphia.-Apr 2 95 1,770,000 2 %, Dec. '97. 11,965,100 2%, %, July 15, '98. 1588,900 3 % S—July, '98. 800,000 3 % Feb. 1, '98. 2,000,000 48 76 76 855/ 1,966,100 |1 588,900 800,000 75 883 8334 30,000,000 8,297,920 †192,500 \$8 share Q. [1,875,000 \$14 sha'e A—Apr.96 500,000 Miscellaneous, -Apr 2: MISCELIATICOUS, -APF 2: American Dist. Teleg. (Phila.)... Bell Teleph. Co. (of Canada.).... Chesapeake & Potomac Telep. Co. (Chicago Telephone Co... Central Dist Prig & Telg. Co. (Pgh.). Empire & Bay States Telegraph Co.. Hudson River Telephone Co... \*Northwestern Telegraph Co...guar Providence (R. L.) Teleph. Co... Southern New Eng. Teleph. Co... 451 400,000 8,960,000 8,564,000 2 % S. 1,000,000 1,000,000 A. & O. 1771,076 §9 share A. Mar. 98 16,000,000 § %, A., April, '98. 1572,800 §5.25 share—1898. 150,000 § % Jan., 1898. 901/ 65 210 150 76 125 1,060,000 10,000,000 1,500,000 1,500,000 1,500,000 1750,000 1750,000 1770,000 1,060,000 148 75 120 117 750,000 750,000 100 50 50 2,000,000 1 % Q, 2,500,000 2¾ % Q, 2 000 000 961/4 100 8.000,000 157 ELECTRIC LIGHT AND ELECTRICAL MFG. COS. 203 Boston, Mass.-Apr 2: 809 Series A. 25 100 40,000,000 30,460,000 2 % Q., Aug., 1898. 100 18,276,000 18,276,000 1% % Q., Jan., 1900 General Electric Co. [old] com. General Electric Co. [new]...... " T.-H. Elec. Co. T. Secur., Series D. Westinghouse Elec. & Mfg. Co. com. Westinghouse El. & Mfg. Co. pfd. Westinghouse El. & Mfg. Co. assent. 301/4 1301/6 240 2 % 41% 62 50 146,700 8,996,058 8,195,126 13/2 Q., Jan., '99. 50 4,000,000 50 11,000,000 Rochester, N. Y .- Apr 2 Rochester Railway Co..... New York.-Apr 2: New YOPK.—APF 2: Edison Elec. Ill'g Co., New York... \*Edison Elec. Ill'g Co., New York... Edison Ore Milling Co... Electric Vehicle Co.......... General Electric Co. [old]....com. General Electric Co. [new]... Interior Conduit & Insulation Co... | Kings Co. El. L. & P. Co... Reading, Pa.—Apr 2 i Heading Traction Co..... kCity Passenger Ry..... (East Reading Electric Ry..... 119 120 100 100 100 9,188,000 4,000,000 7,938,000 2,000,000 1% % Oct., '98. 1,000,000 | 1,000,000 | Semi-an.,Jan. & Jy | 350,000 | 1,000,000 | Jan., '98. | 1,000,000 | Jan., '98. 30,450,000 2 % Q., Aug., 1898. 18,275,000 1½ % Q.,Jan., 1900 1,000,000 2,500,0 00 A. & O. St. Louis Mo.-Apr 2 18016 150,000 400,000 2 % Dec., 1888. 2,400,000 1½ % Jan., '99. 2,479,000 1½ % Jan. '99. 2,500,000 4 % Oct., '93. 2,000,000 2½ % Jan., '99. 20,000,000 1½ % Jan., '99. 800,000 50c., Dec., '89. 23 110 125 400,000 2,500,000 2,500,000 2,500,000 Pittsburg, Pa.-Apr 2 Allegheny County Light Co...... East End Electric Light Co..... 172 168 2,000,000 Philadelphia, Pa.-Apr 2 2,400,000 1,000,000 500,000 #Electric Storage Battery Co...com. #Electric Storage Battery Co...pfd. Northern Elec. Light & Power Co.. Southern Elec. Light & Power Co.. 2,000,000 141 93% 100 100 8,500,000 5,000,000 500,000 1,000,000 2,500,000 3 %, Jan., '99. 95 13 80 1,000,000 85 10 10 10 550.00 131% 2,500,000 187,500 187,500 4,000,000 8 % A., July, '95. 4,000,000 Miscellaneous.-Apr 2: San Francisco, Cal. - Mar. 600,000 50c. monthly. 47 25 10 150 43 500,000 California St. Cable RR... Geary Street Park & Ocean RR... Market Street Ry... rresidio & Perries RR... 119 1,000,000 26 14 151 .... 1,000,000 18,750,000 1,000,000 875,000 \$2.50 share, '96. 18,750,000 Q., 60c. per share. 611 550.000 175,000 10 Scranton Pa -Apr 2 1,200,000 2 % Q., Oct., '98. ..... m Scranton & Carbondale Trac. Co... m Scranton & Pittston Traction Co... 2,500,000 163 1,085,000 1% Q 1,085,000 1% % Q 3 % S, Dec. 1, 95, 500,000 1,050,000 Springfield III.-Apr 2 ..... 105 springfield Consolidated By . 750,000 100 750,000 †On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to \$20,827,200, of which \$18,276,000 is common and \$2,551,200 preferred. I Ex div. Becently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co. Soringfield O.-Apr 2 Springfield Street By..... 100 1,000,000 11 1,000,000 Springfield, Mass.-Apr 2. pringfield Street Ry..... 1,200,000 ALLIED INDUSTRIES. 100 1.166,700 8 % A 207 212 Toronto Canada.-Apr 2 Boston Mass.-Apr 2: 6,000,000 134 % 8. 4,000,000 4 % 8. Toronto Street Ry...... Montreal Street Railway Co...... 100 6,000,000 8 100 Delaware Gas Light Co....... Delaware Gas Light Co....... American Electric Heating Co 500,000 500,000 72% 98 4,000,000 ..pref. 50 10,000,000 200,000 Washington, D. C.-Apr 2: Street Ry. & Illu'g Properties...pfd 100 United Electric Securities Co...pfd. 100 4,500,000 1,248,700 \$2 p. sh. Jan. 26, '99 1,000,000 \$3.50 p.sh. Nov'98. Belt Ky. Co... Oapital Traction Co... Dolumbia Ry. Co... Eckington & Soldiers' Home Ry... Georgetown & Tenallylown Ry... Metropolitan RR. Co... 100 112,000,000 12,000,000 65c, per sh, Oct. 97. 103 400,000 400,000 6 % Å. 107 New York.-Apr 2: 85 15 40 16 707,000 652,000 200,000 Onsolidated Electric Storage Co... Safety Car Heating & Lighting Co... Worthington Pump Co.....com Worthington Pump Co.....pfd 8 150 12 155 458,900 2½ % Q. 100 1,000,000 5,500,000 2,000,000 5,500,000 2,000,000 7 % A 109 110 Worcester, Mass.-Apr 2 8,000,000 2,000,000 3 % S., Feb., '98. 542,500 4% %, 1897. \*Worcester Traction Co...... com. Worcester Traction Co...... % pld. Worcester & Suburban Street Ry... Philadelphia Pa.-Apr 2 Electro Pneumatic Trans. Co.... United Gas Improvement Co...scrip. Welsbach Commercial Co....com. Welsbach Commercial Co....pfd. Welsbach Light Co... Welsbach Light Co., Canada.... 10879 1,500,000 ... 50 100 100 162 10,000,000 91 52 40 13 Wilkesbarre, Pa.-Apr 2 5 % 55 41 13/4 8,500,000 X Q Wilkesbarre & Wyoming Val. Trac.. 100 5,000,000 5,000,000 1%, Jan., '97. \*Unlisted. † Paid in. † Full paid. | Outstanding. | Ex-div. a Leased to Hestonville, Man & Fairmount Passenger ky. for 6 % on stock per annum. b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union 500,000 Pittsburg, Pa.—Apr 2. Oarborundum Mfg. Oo...... Standard Underground Cable Co... 200,000 Q charges and all indebtedness of constituent and leased companies assumed by Union Traction Company. c Practically all shares owned by Union Traction Company. d Lease to Frankford & Southwark Passenger Ry, assumed by Electric Traction Co. c Leased to Electric Traction Company. f Controlled by Frankford & Southwark Passenger Railway. 175 180 1,000,000 Miscellaneous.-Apr 2: 14 104 82 55 105 4 100 100 25 100 100 100 1,000,000 2 % 58 109 8 1,250,000 1,250,000 % % Feb. '98 ... 52 50 65 90 106 ..... ..... .... 50 80 2 % Sept 1,'98. 100 500,000

# BONDS.

PASSEN	GER R	AILWA	Y.				PASSENGER RAILWAY.							
NAME.	Amou		Due	Interest periods.	Bid.	Asked.	NAME.	Amo		Due	Laterest periods.	Bid.	Askob	
Albany N. Y.  Date of Quotation—Apr 2, 1900  The Albany Ry. CoCons. mtg. 5s. I'Watervleit Turnpike & RRlst mtg. 6s. I'Watervleit Turnpike & RR2d mtg. 6s. Troy City Railway Co1st 5s  Interest guar. by Albany Ry. Co. I'Principal and interest guar by Albany Ry. Co. Baltimore Md.		427,500 875,000 850,000 150,000	1947 1919	M. & N. M. & N. M. & N.	*118 *117 *125 *123 *116½	1271/2	New Orleans La.  Dote of Quotation—Apr 2, 1900  Canal & Olatborne RR cons mtg. 6s Crescent City RR list mtg. 6s Orescent City RR list mtg. 6s New Orleans City RR list mtg. 2, 5s New Orleans City RR list mtg. 2, 5s N. Orleans Rallroad Co Cons. mtg. 6s orleans Rallroad Co Cons. mtg. 6s (St. Charles St. RR. Co list. mtg. 6s (\$2428.500 in escrow to retire New Orleans City RR. Co.'s list mtg. bonds.  \$1890,000 outstanding.  New York.	5.000,000 416,500 5,000,000 850,000 800,000 800,000	50,000 8,000,000 899,000 2,599,500 850,000 800,000	1899 1948 1908 1948 1907 1912	J. & D. J. & J. F. & A.	1053%	112 118	
Date of Quotation- Apr 2, 1900 United Electric Ry. Colst mtg g. 4s  **** "	1,500,000	8,000,000	1949 1911 1929 1901 1942 1900 1906 1912 1982	M. & N. M. & N. M. & S. J. & D. J. & J. N. & M. J. & J.	102 74% 118% 119 104% 121 101 102% 119 116 117	102¼ 75 120  121¼  121 117	Date of Quotation—Apr 2, 1800 Atlantic Ave. (Brooklyn)Imp. g. 58 Atlantic Av. (Brooklyn).lstgen.mig.58 †Atlantic Av. (Brooklyn)Cons.mig. 58 †Bro'dway & 7th Ave.lstcons.mtg. g. 58 Broadway & 7th Avelst mtg. 58 Broadway & 7th Ave2d mtg. 58 Broadway & 7th Ave2d mtg. 58 Broadway Surface2d mtg. 58 Broadway Surface2d mtg. 58 Brooklyn City & Newtownlst mtg. 58 Brooklyn City & Newtownlst mtg. 58 Brooklyn Heights RRlst.mtg. 58 Brooklyn Heights RRlst.mtg. 58 Brooklyn, Q's Co. & Sub'nlst mtg 58 Brooklyn, Q's Co. & Sub'nlst mtg 58 Brooklyn, Q's Co. & Sub'nlst mtg 58 Brooklyn, Q's Co. & Sub'nlst cons. 58	759,000 8,000,000 12,500,000 1,500,000 500,000 1,125,000 6,000,000 2,000,000 1,000,000 250,000 8,500,000	1,966.000 7,650,000 1,500,000 1,125,000 1,125,000 6,000,000 2,000,000 448,000 250,000 8,500,000 2,750,000	1909 1981 1948 1904 1914 1924 1905 1941 1989 1988 1941 1941	M. & 8. A. & O. J. & D. J. & D. J. & J. J. & J. J. & J. J. & J. J. & J. M. & N.	95 107½ 115 128 104 108 115 105 116 115 101 104 112 107	110 116 125 1053 110 117 106 117 116	
April of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.  Boston, Mass.  Date of Quotation—Apr 2, 1900 †Lynn & Boston RR	5,879,000 8,000,000 2,000,000 500,000 850,000	8,702,000 8,000,000 2,000,000 47,000	1902	J. & D. M. & N. M. & S. J. & J. J. & J.	114 1041/4 112	115 106	Brooklyn Rapid Transitgold 5s Bleecker St. & Fult'n Fer'y RR. Ist mtg. 7s Cent P'k, N. & E. R. RR. Ist cons. mtg. 7s Central Orosstown RR	1,200,000 250,000 250,000 1,000,000 1,000,000 1,000,000 1,500,000 12,500,000 12,500,000 13,500,000 12,500,000 15,000,000 15,000,000 15,000,000 15,000,000 150,000 2,000,000	800,000	1900 1902 1922 1908 1982 1914 1914 1915 1998 1999 1909 1909 1909 1909 1909 1909	J. & D. M. & N. J. & J. J. & J. F. & A. F. & A. M. & S. J. & J. M. & S. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J.	109½ 101½ 107 125 101 117 102 108 116½ 89 124 120 120 128 116½ 106 118 110	108 109 108 120 105 117 125 121 109 117 1123/4 108 116 114	
Chicago III.  Date of Quotation—Apr 2, 1900 Ohicago City Ry	1,000,000 1,000,000 7,500,000 1,500,000 4,040,000 15,000,000 8,171,000 500,000 500,000 4,100,000 4,100,000	600,000 7,500,000 4,040,000 8,781,200 15,000,000 3,171,000 500,000 2,500,000 2,500,000 3,969,000 6,000,000	1908 1929 1929 1907 1982 1928 1942 1906 1911 1900 1927 1928 1911	F. & A. J. & D. A. & O. J. & J. J. & J. J. & J. J. & J. J. & J. M. & N. J. & N. J. & D.	1013/4  1081/6  96 106  108	23/4 102  109  96/6  111 102 107	ttwestchester Electric RR1st mtg. 5s  †\$1,085,000 in escrow to retire gen. mtg bonds. 134,880,000 in escrow to retire maturing obligations. †\$552,000 in escrow to retire 1st and 2d mtg. bonds. 2In treasury, \$80,000. 1; Guar. by Union Ry. Co. TOPONO CANAGS. Date of Quotation—Apr 2, 1900. Montreal St. Ry	2 500 000		1908	M. & S. M & S.		0000	
†Redeemable at option on 60 da. notice.   Funded debt assumed by Ohicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.   Subject to call after Oct. 1, 1899, at \$110 and interest.  Assumed by W. Chicago St. RR. Co., lessee.  Int. guar. by W. Chicago St. RR. Co.   Cincinnati, O.   Date of Quotation—Apr 2, 1900.    Cincinnati, Co.   Date of Quotation—Apr 2, 1900.   Cin. New. & Cov.St. Ry. 1st Con. mig. g. 5t   Mt. Adams & Eden P'k In 1st mig. 6s.   Mt. Adams & Eden P'k In 1st mig. 6s.   Mt. Adams & Eden P'k In 1st mig. 6s.   Mt. Adams & Eden P'k In 1st mig. 6s.   Mt. Adams & Eden P'k In 1st mig. 6s.   Mt. Adams & Eden P'k In 1st mig. 6s.   Mt. Adams & Eden P'k In 1st mig. 6s.   Mt. Adams & Eden P'k In 1st mig. 6s.   Mt. Adams & Eden P'k In 1st mig. 6s.   Mt. Adams & Eden P'k In 1st mig. 6s.   Mt. Adams & Eden P'k In 1st mig. 6s.   Mt. Adams & Eden P'k In 1st mig. 6s.	8,000,000 46,000 100,000	2,500,000 46,000 100,000 581,000 250,000	1922 1900 1905 1906 1912		118 % 108 % 114 108 % 121 % 122 % 182 %	1141/4 104  1221/2 187	Date of Quotation—Apr 2, 1900 Continental Pass. Ry	800,000 100,000 150,000 250,000 1,125,000 5,698,210 200,000 1,800,000 1,000,000 29,785,000 750,000	250,000 458,000 867,000 1,018,000 100,000 29,724,876	1901 1905 1911 1912 1948 1910 1917 1908 1911 1945 1905	J & F. & A. & O. A. & O.			
† Assumed by the Cincin. St. Ry. Co. [\$250,000 reserved to retire 1st mig. bds. Cleveland, O. Date of Quotation.—Apr 2, 1600 aBrooklyn Street BR. Co	600,000 8,000,000 2,000,000 8,500,000 1,500,000 1,000,000 600,000 200,000	600,000 2,500,000 2,000,000 1,249,000 1,500,000 1,000,000	1908 1922 1909 1918 1918 1910 1922 1915	M. & S. J. & J. J. & J. M. & S. M. & N.	1061/4 1181/4 1051/4 106	107 114 × 106 107 107 ×	People's Traction lines purchased.  Pittsburg, Pa.  Date of Quotation - Apr 2 1500  Birmingham, Knox & Alientown	500,000 875,000 1,250,000 1,500,000 1,500,000 1,250,000 750,000 750,000 1,500,000 1,500,000 1,500,000 2,500,000	875,000 1,250,000 1,500,000 50,000 1,250,000 750,000 250,000 1,500,000 500,000 1,400,000 2,000,000	1980 1927 1980 1918 1942 1928 1924 1927 1929 1922 1980 1984	J. & J. J. & J. J. & J. M. & N. J. & J. A. & O. M. & N. J. & J.	10954	118	
DetPoit, Mich.  Date of Quotation - Apr 2, 100 †Detroit Citizens' St. Ry	7,000,000 400,000 1,800,000	8,885,000 877,000 1,800,000	1902	A. & O.	105	102½ 106½	Providence R. I.  Date of Quotation Apr 2, 1600  Newport Street ByCoupon 5s United Trac. & Elec. Coist mtg. g. 5s  St. Louis.	500,600 50,000 9,000,000	,	1910	J. & D.	116	118	
New Haven Conn.  ;Date of Quotation—Apr 2, 1:00  New Haven St. Rylst mtg. g. 5s.  New Haven (Edgewood Div.)lst.mtg.5s  Winchester Avenue RR—lst mtg. g. 5s,  Winhester Avenue RRDeben. g. 5s,	600,000 250,000 100,000 100,000	600,000 250,000 500,000 24,00	1914 1912	J&D M&N M&S	111 111 109 	  nt. *U:	Bate of Quotation—Apr 2, 1500  Baden & St. Louis RR	1 600 000	250,000 1,600,000 1,800,000 000 000	1912 1907	J & J	100 102 109 117	102 1021 1094 118	

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PASSE	GER F	RAILW	AY			
	Ame			Interest	-	
NAME.	Authorized.	Issued.	Due	periods.	Bid.	Asked
St. Louis.  Date of Quotation—Apr 2, 1400  Jefferson Avenue By	1,000,000 400,000 125,000 1,000,000 75,000 2,000,000 800,000 500,000 1,091,000 8,500,000	400,000 1,500,000 800,000 125,000 900,000 75,000 2,000,000 1,400,000 500,000 1,091,000 1,787,000	1911 1916 1910 1902	J. & D. M. & N. J. & J. M. & N. F. & A. M. & N. J. & J. A. & O.	108 108 105 100  100 99% 108 80 106 116 100 121	105 109 106 102  101 100 × 104 84 108 118 100 × 122
mig. \$800,000 in escrow. ††\$200,000 in escrow to retire 1st mtg. sde.  San Francisco Cal.  Da:s of Quotation—Mar, 1900.  Californ's 8t. Osbie BBlst mtg. 5s. †Ferries & Cliff House Bylst mtg. 5s. Geary St., Park & Ocean BR.lst. mtg. 5s. Market St. Oable By. Colst mtg. 5s. Market St. Oable By. Colst mtg. 6s. †Metropolitan By. Colst mtg. 6s. †Park & Cliff House BBlst mtg. 6s. †Park & Ocean BBlst mtg. 6s. †Park & Ocean BBlst mtg. 6s. *Park & Ocean BBlst mtg. 6s. *Jount St. By. Colst mtg. 5s. †Controlled by Market St. By. Co.  Washington D. C.  Dats of Quotation—Apr 2, 1900	1,000,000 650,000 1,000,000 8,000,000 200,000 350,000 250,000 700,000 1,000,000	900,000 650,000 671,000 8,000,000 2,000,000 250,000 250,000 900,000	1915 1914 1921 1918  1918 1912 1914 1912 1918	A. & O. J. & J. A. & O. J. & J. J. & J. M. & S.	114  126 ½ 105 ½ 115	117 117 95  107
Belt By. Oo	500,000 500,000 200,000 500,000	200,000	1911	J. & J. A. & O. J. & D. J. & J.	182	••••
Bridgeport Traction Co	2,000,000 5,000,000 4,000,000 8,000,000 15,000,000 2,000,000 4,000,000 6,000,000 5,000,000 5,000,000 1,250,000 5,000,000 1,250,000 1,250,000 1,250,000	1,688,000 8,543,000 8,000,000 2,866,000 2,261,000 5772,000 8,800,000 922,000 4,981,000 4,981,000 4,050,000 2,878,000 450,000 4,989,000 1,000,000 4,298,000 1,000,000	1981 1988 1982 1982 1983 1938 1920 1938 1930 1919 1928 1928 1902 1981 1980 1987	M. & N. M. & N. J. & J. J. & D. J. & D. J. & J. J. & J. J. & J. J. & J.	108 118 104 112 115 20 80 119 11014 108 1085 108	110 105 118 1113% 85 11934 11034
1 (\$620,000 in escrow.					*With	nt'rest
ELEOTRIO LIGHT AND	) ELE	OTRIC	AL	. MFC	a. o	os,
ROSTON, MASS.  *Date of Quotation - Apr 2 1900 Delaware Gas Lt. Co.,1st m. 5s, g. Edison Elec. Illuminating Co., Boston General Electric Co.,gold coup, deb. 5s  Pittsburg Pa  Date of Quotation—Apr 2, 1900 Allegheny County Light Co6s.	800,000 2,026,000 10,000,000	800,000 8,750,000	 1922 1911	J. & J. Quar. J. & J.	106 157 116	•••••
Westinghouse Elec. & Mfg. Co. Scrip 6s.  Miscellaneous.—(Apr 2, 1900.)  Edison El. Illg. Co. (N. York) let m. 5s  Edison El. Illg. Co. (N. Y.) con. m. g. 5s.  Edison Elec. Illg. Co. (Brooklyn)  Kings Co. El. Li. & Pow. Co. let mig. 5s.  Kings Co. El. Li. & Po. Co. pur. money 6s.  Milwaukee El. Ry & Li. Co. let con. g. 5s.  United E'ec. Light & Power Oo(N. Y.)	4,812,000 15,000,000 5,000,000 2,000,000 2,500,000 5,176,000 8,000,000	2,188,000 5,000,000 2,500,000 5,176,000 6,108,000	••••	M. & S.	109 124 122½  100 120 102½	124 103 122
Miscellaneous.  Date of Quotation - Apr 2, 1900  American Bell Telephone	iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii		1908	F. & A.  J. & D.	100½  114 108	10 t  115 106
Miscellaneous.  Date of Quetation - Apr 2, 1900  American Electric Heating7s.  Armington & Sims Engine Co	75,000	5 0.010	1942 1904	J. & J. J & D.	106	25 107 

## NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 161@161c.; Lake,163@171;;; casting, 16@161;.

The annual meeting of stockholders of the Electric Company of America will be held the latter part of this mouth.

There has been incorporated at  $Trenton,\,N,\,J$  , the Hanscom and Hough Storage Battery Company, with a capital of \$3.500,000

The Citizens' Traction Company, of Ohkosh, Wis., the capital of which is \$225-000, was recently sold to Emerson McMillin & Co. of New York.

The Maxican Telegraph Company has declared a quarterly dividend of 2½ per cent., payable April 16. Books close April 7 and reopen April 17.

The New York and New Jerrey Telephone Company has declared a quarterly dividend of 12 per cent., payable April 14 to stock of record April 5.

Tae new Eagland Telephone and T legraph Company has declared a dividend of \$1.50 per share, payable May 15. Books close April 6 and reopen May 8.

Tas Control and South American Telegraph Company has declared a quarterly dividend of 1½ per cent., payable April 9. Books closed March 31 and reopen April 10.

The annual meeting of the stockholders of the General Electric Company will be held at Schenectady, N. Y., Tuesday, May 8 at  $12\,\mathrm{M}$ . The transfer books will be closed at 12 o'clock April 14 and reopen at  $10~\mathrm{A}$ . M May 9.

It is reported that the Bridgeport (Conn.) Traction Company, operating 49 miles of track, is to be absorbed by the Connecticut Lighting & Power Company, which has acquired control of several street railways in the Naugatuck Valley.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 24 a 25; New York Electric Vehicle Trusportation, 104 all; New Eligiand Transportation, 64 ab 3; Felephole & Telegraph Company of America 48 all; Gramophone, 49 all 51.

A member of the General Electric Antomobile stockholders' committee says that no proposition for the financing of the company's affairs has as yet been prepared, and will not be until a considerable amount of stock has been deposited and the committee looks into the situation.

A certificate has been filed with the Secretary of S ate at Albany by the Patchouge E estric Light Company, setting forth that its capital stock has been increased from \$20,000 to \$40,000, consisting of shares of \$50 each. The company's directors include Edwin Bailey and George D. Gerard.

By action of the governing committee of the New York Stock Exchange on the 28th ult., absolute control of the telephone and telegraph wires running from the flor of the Exchange is given into the hands of the committee on arrangements. It is the purpose of the Exchange, in taking this step, to avoid as far as possible any direct communication between members and proscribed outsiders. It was intimated that this is the first step in the direction of various reforms.

The Tax Commission of Naw York State has fixed the value of the public franchises of the proceeds as the state of the process and lighting corporations of this city as follows: Brooklyn Rap d Transit System \$30.766 770; Manhattan Elevated, \$55 499, 300. Metropolitan Street Railway. \$62 068 93); Third Avenua System, \$19,728,100; Edison Electric of New York, \$9111,298. The value of all the franchises in New York City is placed at \$26,573,006.

At the regular meeting of the governors of the N Y. Stock Exchange on the 28th ult, the following securities were a lmitted to the training list: Commercial Cable Company—83 333,300 additional capital stock, making amount listed to date \$13 333 3 00. Matropolitan West Side Elevared Railway Company (of Chicago)—\$10,000,000 first mortgage 4 per cent forty year go d coupon bonds of 1938, \$9,000,000 5 per cent non-cumulative preferred stock and \$7,496,700 certificates of Central Trust Company of New York.

President didden of the Eric Telephone System is reported as saying that the investment in telephone properties in the United States is about the same as the investment in telegraph properties. In a substantisting statement the following figures are given: Telegraph investment, Western Union Telegraph Company, \$125,000,000; Pistal Telegraph Company, exclusive of cables, \$13,000,000; total \$138,000,000. Telephone investment, \$137,000,000, making a grand total investment in electrical communicating properties in the United States of \$275,000,000.

Judge Lacombe's order authorizing Receiver Grant to make contracts for power with the Matropolitan Street Railway Company and to complete the equipment of the Taird Azenue Railroad, says: "The work will require a considerable expenditure and the receiver appears to be without sufficient funds available for construction account. He is, therefore, authorized to borrow the money on ordinary receiver's notes. Should the recent change of ownership bring about a speedy termination of the receivership, they will be provided for with the other debts of the road."

The annual report of the American Bell Telephone Company, which covers operations for the calcudar year 1893, shows total carnings of \$5,76),106 as compared with \$5,448,701 in 1898. The total expenses were \$757,461; those of 1893 were \$615,885. The expenses included \$591,826, cost of operations. The net earnings were \$5,001.644, against \$4,802 \$18 in 1898, and the balance for 1899 in \$4,072 949, against \$4,393 966 in 1898. Extra dividends \$199,000 has been carried to the surplus account, raising the surplus figures to \$2,975,678. For 1899 the company earned 16 per cent, on the stock, against 17 per cent, in 1893 and 16 per cent, in 1897.

By a vote of 400,000 out of 504,000 shares, the lease of the Consolidated Traction Company of Pittsburg, Pa., was ratified at a meeting of the stockholders on Saturday. The minerity profested against the lease and the protest was entered on the minutes. The capital stock of the Consolidated Traction Company is \$3,000,000, of which \$15,000,000 is common and \$15,000,000 is preferred. Only \$9,600,000 of the preferred has been issued. The Union Traction Company will have a capital stock of \$3,000,000, 2) per cent. paid up, and the remainder of the stock assessable as required. C. L. Magee will be president of the company. The new company will also control the systems of the United Traction Company and the Monongahela S reet Railway Company, the only line outside of the combine being the West End Traction Company.

A certificate incorporating into one concern the principal gas and electric light and power companies in New Jersey was filed with the Secretary of State in Trenton on March 29. The companies merged by the certificate recently filed are the Newark Electric Light & Power Company, the Theoremsen-Houston Electric Company, of Newark, the Essex County Electric Company, the Suburban Electric Light & Power Company, the Montclair Light & Power Company, the Excelsion Electric Company of Harrison, the Kearney Electric Light & Power Company, the Hulson County Electric Company, the Jersey City Electric Light Company and the Newark Schuyler Electric Light Company. Of the \$20,000.000 capital authorized by the new certificate, \$5.50,000 has been issued or is outstanding. The president of the new gas and electric corporation is Philip N. Jackson, Dudley Farrand is vice-president, L. H. D. Gilmour is secretary and Percy Ingalls is treasurer. By this move the companies interested will save hundreds of dollars annually in taxes.

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No. 14.

# **FLECTRICITY**

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## EDITORIAL NOTES.

The Paris Exposition.

Before we go to press again the opening day of the Paris Exposition will have come and gone, and in view of this fact it

might be in place to outline in a general way the principal electrical and kindred features of this great World's Fair.

Some idea of the magnitude of this undertaking may be had when it is stated that the Exposition covers an area of 270 acres, the buildings and other features involving an expenditure of some \$25,000,000.

Of the various buildings devoted to the arts and sciences, that in which will be found the electrical exhibits will unquestionably attract much attention. From an artistic standpoint it is everything that could be desired, and as to size by far the largest so-called special palace on the grounds, covering as it does an area of 318,750 square feet. In it will be found the latest and most up-to-date electrical machinery and apparatus, as well as the principal electrical inventions of recent years. It is here in the basement that the energy for operating the thousands of electric lights throughout the Exposition will be generated, while on the ground floor will be in evidence electric heaters, electric cooking utensils, electrical signs, electrical toys, electro-plating apparatus, sections of ocean cables, switchboards of every description, and telephone and telegraph instruments.

There will also be a United States electrical retrospective exhibit, in which will be found many models of inventions by well-known American scientists, such as Benjamin Franklin's large machine for generating static electricity, an electro-magnet designed by Prof. Henry, and some of Morse's early telegraphy apparatus.

Visitors will also be afforded an opportunity of seeing a typical American machine shop in operation. This exhibit will be in an entirely separate building, 343 feet long and 77 feet wide, erected out of material manufactured on this side of the Atlantic. Here will be found in operation American machinery, with all modern appliances, including traveling cranes, hangers, shafting, electric motors, etc.

From an engineering point of view, perhapsone of the most novel features of the Exposition will be the movable platform operated by electricity, and described in detail in the issue of Electricity of February 22, 1899. This railway will be elevated, and will be wholly within the limits of the Exposition grounds. It will consist of two platforms. one running at a speed of about 2½ miles an hour, the other at a speed of about 5 miles. No more difficulty will be experienced in stepping from the low speed platform to the high speed walk, than there will be in stepping from the motionless stations to the low speed platform.

Another interesting feature of the Exposition will be the great telescope. This instrument, designed upon an entirely new plan, will, it is claimed, magnify 10,000 times, or in other words, is more than twice as powerful as any telescope heretofore brought out.

We are advised by a foreign correspondent that all the principal features of interest will be completed by the opening day and that the management of the Exposition is preparing to handle in safety the enormous crowds that are expected. The main gateway will be known as "L'Entrée Monumentale." The show will be open sixteen hours a day and this entrance is arranged to give passage to 60,000 persons an hour. This great gate is virtually a triumphal arch, decorated over its front with the arms of the city of Paris. It is surmounted by a Statue of Liberty. The gate, including two great friezes on its sides representing labor, cost in the neighborhood of \$13,000.

\* \* \*

Conservative England.

Some time ago we referred in these columns to the antipathy of the residents and merchants of

London, England, against the use of the telephone. This aversion was carried to such an extent that banking houses were said to look upon Prof. Bell's invention as something "not quite respectable," with the result that business was done by means of slow-going messengers. From all accounts this same spirit of conservatism would seem to exist in regard to electric light and power schemes, for in the case of a number of bills now before the House of Commons to incorporate electric power companies to furnish light, etc., opposition is being met with, on the ground that they are "a direct attack upon the rights, privileges and duties of municipal corporations," and that it "would practically set aside the existing law which adequately protects corporations in the exercise of duties which they have to perform." This hesitancy to grant privileges to private corporations, probably accounts in a great measure for the apparent backwardness of England, and more especially London, in the matter of electric lighting. The London "Times," referring to this subject in a recent issue, said:

"The principal streets of London are still lit with the glimmering gas lamps of fifty years ago. There is not a town, and hardly a self-respecting village in America, which is not bright with electric light. It is true there are three hundred electric lighting orders at present in force in this country, more than three-fourths of them in the hands of local authorities. But under the 236 orders issued to local authorities, according to a recent return, electricity was only being supplied in 81 cases. In 104 cases no steps whatever had been taken to carry the order into effect."

If the situation in London as regards lighting is as stated it scarcely compares favorably with that existing in New York City where the annual cost of lighting by electricity may roughly be estimated at about half a million dollars. Furthermore, as the above item states, it is difficult to find on this side of the Atlantic a reasonable sized town in the East or middle West that is not lighted by electricity, and it is by no means unusual to find villages of from four to five hundred inhabitants enjoying the advantages of incandescent lamps. That this is possible is owing to the fact that municipal ownership in this country is the exception and not the rule. A private corporation erects a plant and furnishes current for lighting and power purposes to small communities situated within a radius of say ten miles, which towns and villages would probably have to wait many years before they themselves would be in a position to erect municipal electric lighting plants. Thus does undue conservatism, as witnessed in the action of the British House of Commons on the private power companies' bills, tend to retard progress.

#### \* \* \*

Electricity as a Rain-Maker. We have several times referred in these columns to alleged discoveries made by Prof. Elmer Gates. Some

time ago mention was made of a method of drawing electricity from the sun's rays, said to have originated in Prof. Gates' laboratory at Chevy Chase, near Washington, and now it is reported by a correspondent named Watkins, of the Philadelphia "Dispatch," that Prof. Gates has discovered that electricity is indirectly the cause of rain. It is also asserted that means have been devised for causing—as yet on a small scale—artificial rain by a proper manipulation of the electric current.

Prof. Gates' theory is that if one locality or cloud becomes positively charged some adjacent locality or cloud must acquire a negative charge, or vice-versa. Midway between these two oppositely charged clouds or regions of moist air there must be one or more secondary regions where their respective particles commingle. Those of one being positive and those of the other being negative they attract, cohere and form rain drops. One region, according to the learned professor, may be a cloud or vapor-charged air mass and the other may be either another cloud or the earth. When disturbances of the so-called electric equilibrium of the atmosphere occur, differences in density, pressure, temperature and moisture result.

The above explanation as to the cause of

rain will probably come as a surprise to persons who have hitherto looked upon it as simply due to a condensation in the atmosphere of moist air.

In support of his theory Prof. Gates is said to have charged a current of moist air as it entered his laboratory through an open window with negative electricity and a similar current from another source with positive electricity. At a distance between the two inlets and where the two currents mingled a mist was seen to form. When asked by the writer of the article already referred to how a complete thunder-storm might be produced by such artifice. Prof. Gates replied that this was done by maintaining a layer of moist air in the top of a room and by charging this to a potential different from that of the floor below. If charged to a sufficiently high potential and with sufficient quickness there would result a sudden flash and discharge, accompanied by a fall of rain upon the floor.

If Prof. Gates' discovery ever extends beyond the laboratory we may expect to see in times of drought Immense static machines invoking rain for farmers by charging the breeze as it blows by either positively or negatively, in the same way that bombs are now occasionally projected into space in certain Western districts to please unsophisticated sons of the soil. And we are not sure but what the one process is as efficacious as will be the other.

## UNDER THE SEARCHLIGHT.

#### Notes and Comments on Various Topics.

The State Board of Railroad Commissioners will give hearings in this city on April 18 on petitions for authority to construct new street railroads. Among the petitions are: New York and Brooklyn Union Transportation Company, to construct an electric or compressed air road four miles long, from Manhattan to Brooklyn; New York, Brooklyn and Jersey City Rapid Transit Company, for a road six miles long, from New York to Brooklyn.

A NEW and improved faradmeter has been invented by Prof. Pupin of Columbia University. The instrument was placed on exhibition last week at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street. Prof. Pupin, upon request, described the apparatus as follows: "The instrument measures the capacity of electric condensers and also of telephone cables and can be used by ordinary workmen who have no knowledge of electricity, and that, too, in any place. Its greatest efficiency is perhaps at manholes leading to underground conduits. It employs interrupted currents such as are used in electrotherapy, and in place of a galvanometer it substitutes a telephone. The method of balancing employed in such measurements is controlled by the sound in the telephone instead of the deflection of the galvanometer needle. A silence in the telephone indicates the correct balance. The reading on the instrument gives then the capacity which is measured. The instrument is very sensitive, is capable of a high degree of accuracy and it also offers the advantage of employing rapidly alternating currents, which avoids many sources of error which usually accompanied the old method."

It is stated on reliable authority, that a New York syndicate has purchased from the Province of Quebec power rights on the Saguenay River from the Grand Discharge to a point a little above Chicoutimi. There is no large fall on this part of the river, simply rapids: and it is understood that, in consideration of the large amount which will be expended for development, the price of the power is merely nominal. One million dollars is to be expended during the first year. The intention is to erect a pulp mill with an initial capacity of 90 tons.

It is stated that the work on the the cable between Emden, Germany, and New York, will begin on May 1. The German Government has given the company a sufficient guarantee to warrant the work, and the contract has been let to a London company. The cable will reach New York by August 1.

A NEW automatic electric safety block signal, which will stop a train without the assistance of the engineer or motorman, is now being introduced. It is applicable to any style of motor power.

SUPERINTENDENT O. T. HOLLOWAY, of the Railway Mail service in Cincinnati, recently issued an order authorizing the establishment of electric car mail service, and the transportation of the mails between Cincinnati, Newport, Covington, Ft. Thomas, Milldale, Dayton and Ludlow over the lines of the South Covington and Cincinnati Street Railway Company.

The Caracas Construction Company of New Jersey is transforming the present horse tramways of Caracas, Venezuela, into electric trolley lines. The company will also build an electric plant to supply the city with electric lamps. The power house will be constructed at Macuto, seven miles from Caracas.

News received from Altoona, Pa., states that the work on the electric lighting of the Gallitzin tunnel has been completed. Two hundred incandescent lamps, arranged along either side of the tunnel at a uniform distance apart, have been put in and furnish excellent illumination. A private plant has been established for the supply of the power for the lights. It is the purpose of the Pennsylvania Railroad Company to equip most of the large tunnels along their lines with electric lights. This has been done in a majority of cases, but there remain a few tunnels yet to be equipped.

SENATOR STEWART of Nevada has introduced a bill in the U.S. Senate authorizing the Secretary of War to grant a permit to the Commercial Cable Company of Cuba to lay and operate a cable between the United States and Cuba.

ALL manner of horseless vehicles will be tested in the automobile races which will be held in connection with the Paris Exposition. It is probable that the first competition will be in May between touring carriages, divided into classes according to the number of people they carry, Each will make five runs of a little less than 100 miles in a day, the speed to vary from fourteen to nineteen miles an hour. The prizes will be medals. Contests between delivery wagons and cabs will take place in June. They must run nineteen miles through Paris on five different days and carry at least 1,200 pounds of freight. Speed contests will take place in July under the rules of the Automobile Club of France. There will be five heats of nearly 250 miles each. There are nine cash prizes, the first being \$1,600 and the aggregate \$6,000,



ALFRED SKITT, general manager of the Manhattan Elevated Railway Company of New York City, has asked for an estimate of the cost of one hundred inclined elevators to be substituted for the stairways which now lead to the stations of the Manhattan road. Plans, specifications and an estimate of the cost of this improvement are now before the officials of the road. The estimated cost is about \$250,000. These proposed elevators will have a carrying capacity of 3,000 passengers each per hour. They will be run on the endless chain principle, and the power will be furnished by small electric motors placed in the stations.

A RESIDENT of Perry, Oklahoma Territory, who is an editor and an electrician, and who during the past year has conducted a series of experiments in wireless telegraphy, claims to have transmitted messages over a thousand miles. He asserts that when his system is perfected messages can be sent 25,000 miles as readily as 100 miles. However, he has given the public no idea of his methods, and until he does the scientific world will be inclined to look in a rather skeptical way on his claims.

Mr. Phelam McCullough, chief electrician of the Toronto Electric Railway, will leave shortly for Liverpool, Eng., to take the position of electrician to the Liverpool Street Railway, which is operated by the council of that city. The corporation has decided to install a complete electric system to replace the horse cars there. Mr. McCullough will superintend the installation

In a recent issue of "Centralblatt für Accumulatoren und Elementenkunde," Prof. Liebenow discusses the subject of dry secondary cells, and among other things gives it as his opinion that efforts to produce a practicalcell of this nature will never prove successful. The investigations into the action of secondary cells have shown that there are electrical concentration currents set up which tend to convey the acid in the pores of the plates from points of maximum to points of minimum concentration. These currents are necessary to equalize the strength of the acid, and effect this far more rapidly than would it be done by diffusion acting alone. When a gelatinous electrolyte, or a dry non-conducting powder is introduced between the plates, this equalization is prevented, and the cell is soon exhausted.

THERE is a rumor current to the effect that the New York Transportation Company, which is controlled by the Electric Vehicle Company, and which is now operating several electrically-propelled stages on Fifth avenue of this city, will in the near future place stages on some of the principal crosstown streets to connect with the different street railway lines.

A foundry about to be built at North Adams, Mass.—one of the largest in the country—will have a central alley 36 feet wide, which will be provided with a 10-ton electric traveling crane for the moving of heavy pieces. Every modern convenience will be introduced, and nothing will be spared to do the best work in the quickest time.

A CABLE dispatch from Havana, Cuba, to the N. Y. "Sun" states that the company controlling all of Havana's street railways commenced on April 4 to change the motive power from horses to electricity. In the outlying districts the work cannot be completed until the sewer and paving problem has been solved, but the streets on which the work is now being done are sufficiently wide to permit the laying of tracks on one side. The tracks will have to be torn up when the city is sewered and the company will stand the loss. The city is in great need of rapid transit. The company proposes to push the change as far as possible so as to be ready to jump in and finish the work when the general overhauling of the city takes place.

Some surprise having been expressed in England because the experiments with wireless telegraphy in South Africa did not produce better results, Signor Marconi has thought it necessary to explain to the Royal Institute why no better success could have been expected. Mr. Bullock and four assistants went to South Africa as representatives of Signor Marconi, and with instructions to use his system there. On their arrival at De Aar they were, according to Signor Marconi, much disappointed at finding that no steps had been taken to provide them with the material without which they could not set up their instruments. Major Baden-Powell came to their assistance, and, thanks to him, they procured masts and the other necessary material, which they set up themselves. In view of the fact that they were obliged to work hastily and to use any material that came to hand, it is not surprising, says Signor Marconi, that wireless telegraphy, under such conditions, was not a pronounced success.

The Electric Railway Company of Berlin, Germany, has placed in service an electrically-operated hearse, with compartments for mourners and friends. The charges for the use of this car are quite moderate, being about \$5. The object of the company in placing a funeral car in service is to lessen the cost of burials for the poorer classes.

THE second day's trial of the new battleship Kearsarge, which took place last week, proved everything that could be desired. All the electric motors were inspected, as well as winches, cranes, steam and hand-steering gear and fire system. The facilities for lowering a lifeboat under service conditions were tested, the turrets were turned through the full arc of train, 270 degrees, and the ammunition hoists and other minor accessories were inspected and tried. The trial of all the electric hoists, winches, etc., proved satisfactory, and the ammunition hoists for the 5-inch and the secondary guns of the "electric operated chain type" could hardly be improved upon, so it is claimed.

NEW ORLEANS, La., will in the near future, so it is stated, make use of wireless telegraphy in connection with its new fire-alarm system. Just how this will be done is not stated.

The London "Electrical Review" is authority for the statement that the increased output of carborundum in 1899 over 1898 is placed in the neighborhood of 50,000 lbs. Considering the active matter in which this industry has advanced, and the demand for the product, this is a substantial advance and demonstrates an increasing popularity of carborundum. The inside dimensions of the carborundum furnaces of to-day are 16 feet long, 6½ feet wide and 5 feet deep. The raw

material is piled 4 feet above the top of the furnace. One thousand electrical horse-power is applied to the furnace for 36 hours, during which time it is estimated that the furnace throws off no less than 7 tons of carbon monoxide gas.

At a meeting of the Municipal authorities of Vienna, Austria, on March 10, it was decided to place with the Schuckert Company of Nuremberg the contracts for the erection of electrical generating stations required for the Vienna electric light and traction schemes. It is proposed at present to install eight generating sets with an output of 3,000 hp. each, of which 15,000 hp. will be used for street railway purposes. The estimated value of the contracts is over \$6,250,000.

One of the greatest objections to the use of electrical driving in small shops comes in at the question of the steam hammer. A steam hammer is a necessity, and the proprietor cannot see that it costs him much more to drive his shop altogether by steam power so long as he must keep up steam for the hammer. In the Longworth hammer, according to a London contemporary, the motive power is derived from any mechanical source, and an electric motor may well be employed as the motive power. The difficulty with power hammers has been the regulation of the force of the blow. In the Longworth hammer this regulation is effected by means of a cushion of air rendered variable in volume under the piston in a controlling cylinder by means of a valve under the control of the attendant. There is a large field for electrically-driven hammers in many shops where the power is small, and steam is used only for a steam hammer. It is the want of such a hammer, or should we say, the small knowledge of its existence, that is one of the obstacles to be encountered by electrical transmission advocates.

ELECTRIC headlights of 5,000 candle power have been placed on the night cars of the Philadelphia & West Chester trolley.

The Automobile Club of London has issued a detailed programme of the motor-car trial which is to be held from April 23 to May 12. The course is from London to Edinburgh and return, and includes one day exhibits at Bristol, Birmingham, Manchester, Edinburgh, Newcastle-on-Tyne, Sheffield and Leeds, and shorter exhibitions at other places. A number of prizes will be given, and more than sixty vehicles of various classes are expected to compete,

According to the London "Financial Times." a company has been formed in Brussels, Belgium, with a capital of \$4,000,000 for the purpose of constructing an electric railway between Brussels and Antwerp. The Allgemeine Elektricitats-Gesellschaft of Berlin is said to be largely interested in the present scheme. The length of the proposed railway would be almost 28 miles, and it is expected that the distance between the two towns would be covered in 35 minutes without interruption. It is proposed that the railway should be connected up with the electric street railways in Brussels and Antwerp, and that the company should also undertake the working of these particular lines.



## ELECTRO-METALLURGY IN EUROPE IN 1800.

BY JOHN B. C. KERSHAW, London.

The year 1899 was not signalized by any striking discovery in the domain of electrometallurgy. Several of the older industries have, however, undergone considerable development, and one or two new processes have reached the stage of practical trial.

The progress in the various industries can be best dealt with under the heading of the various metals or compounds.

Aluminum.—The number of factories in operation in Europe for aluminum production is now five. These are situated at Foyers, St. Michel, Le Praz, Neuhausen and Rheinfelden.

The companies owning the works at Le Praz and at Neuhausen have raised fresh capital during 1899, but it is impossible to say what proportion of this will be devoted to the aluminum manufacture. The latter company is interested in power developments which are occurring at Lend-Gastein in Austria. The works at St. Michel passed into other hands during 1899, and it is probable that as a result of this transfer other manufactures may be carried on with the power available.

No reliable figures can be given for the output of the above five factories in 1899, owing to the refusal of those having the management to give any information on this subject for publication.

Two new aluminum factories are projected in Europe—at Lend-Gastein and at Almeria—both in Austria. It is improbable that these will be proceeded with, until the demand for the metal has greatly increased.

The Peniakoff process for producing aluminum from the sulphate received industrial trial at Selzaete in Belgium in 1899; but the writer has been unable to obtain any information concerning the results, and one can only surmise that these have not been promising.

With regard to the utilization of aluminum, its use as a substitute for copper for conducting purposes, has not progressed so rapidly in Europe as in America. This is to some extent due to the lack of long distance power transmission schemes. Aluminum is, however, receiving trial both in England and Germany, for telegraph and telephone purposes; and in the north of England it is about to be tried on an electric tramway as trolley wire.

Aluminum alloys are receiving considerable attention for many purposes. One of the largest English cycle companies now lists cycles built of an aluminum alloy, and in France an alloy called "partinium" is about to be used for constructing parts of the bodies of motor cars. Aluminum alloys were also used in many parts of the structure of the racing yacht Shamrock which contested the cup match in 1899.

For decorative metal work of all kinds, the use of aluminum is slowly extending, and the English Admiralty have now accepted it for internal work of this class on English war vessels.

The use of aluminum in place of stone for lithographic printing is rapidly increasing, and in Germany, where this method of color printing was first tried, it is stated that over 100 firms are now using it. The new metal has also been adopted by printing firms in England and France. The chief gain is in speed, as the aluminum plates can be used in rotary presses. A company with a capital of \$552,000 has been

formed for exploiting the new process in Europe.

The production of steel and copper plates coated with aluminum by the Wachnitz process is said to be extending in Germany, and such plates are being used for the manufacture of cooking vessels. The process consists in rolling the two plates under great pressure while at a red heat.

Bullion Refining.—There is nothing new to report concerning this industry, which though small is believed to be highly remunerative. The only two electrolytic bullion refineries known to the writer, are in Germany at Frankfort and at Hamburg. Details of these will be found in the issue of ELECTRICITY for May 11, 1898.

Calcium Carbide.—This industry has shown remarkable growth during 1899. The writer has estimated that at the close of the year there were 68 carbide factories in operation in Europe, and 16 in course of erection, a gain of 48 as compared with an estimate made at the commencement of the year. With a few exceptions all these factories are operated by waterpower, and in Italy especially considerable development is now occurring in the exploitation of water power for this and other manufactures. No reliable estimate of the carbide production in Europe during 1899 can be made; the total given by Kraft und Licht, namely 196,000 tons being certainly much too high. In France between 30,000 and 50,000 hp. is available for carbide production, but not onehalf this power is regularly utilized in the manufacture.

During 1899 several new carbide factories have commenced to produce, one at Iajce in Bosnia, and two at Sarpsfos in Norway being the most important. When completed the former will utilize 8,000 hp. and will be the largest carbide factory in Europe. At Sarpsfos the two factories (under different management) will utilize 4,500 hp.

Very full details of the cost of carbide at Meran in the Austrian Tyrol where 2,400 hp. is used in the Gin & Leleux type of furnace, have been published during 1899. Power at this spot costs only \$11.3 per EHP. year, and the total cost of carbide works out to \$34.8 per ton; of which one-fourth is debitted to electrical energy.

Triphase current is now being used for carbide manufacture in Europe with success—notably at St. Marcel in Italy, and at Langenthal in Switzerland. Experiments have also been made which prove that the grinding of the lime and coke is unnecessary and leads to much loss of these raw materials. At the Buda-Pesth Acetylene Congress and Exhibition, held in May, 1899, interesting papers bearing on the industry were read by Liebetanz, Ahrens, Caro, Guilbert, Lewes and others. A similar exhibition was held at Cannstadt in Germany later in the year.

Moissan, the noted French chemist, has been experimenting with carbide during 1899, and has discovered that pure calcium carbide is transparent and colorless. The opacity and dark color of the commercial product are due to the presence of iron.

With regard to the utilization of carbide, its use for acetylene generation is still the chief outlet. The use of powdered carbide as a germicide in the grape growing districts of southern Europe has not apparently been a success, and its use as the starting point for the manufacture of organic products has likewise not progressed beyond the laboratory. The Villon

process for production of ethyl alcohol from acetylene is said to be at work in Russia, but as it demands a supply of carbide at \$20 per ton, its development will not be rapid.

The use of acetylene as an illuminating agent appears to be progressing most rapidly in Germany, where at the commencement of 1899 there was said to be 170,000 acetylene burners in use. In that country acetylene mixed with oil-gas has been widely adopted by the railway authorities for carriage illumination, and this mixed gas is said to be giving every satisfaction. Its preparation is carried out under the Pintsch patents. In Germany several acetylene central supply stations have also been erected, and street lamps and private houses have been provided with a constant supply of the new illuminant. Similar central supply stations have also been erected at about six places in the United Kingdom, and a very large number of country houses have been provided with private acetylene installations, including generating plant. Considerable progress is also reported in southeastern Europe, where oil is the only rival illuminant, and both in Hungary and Greece central generating stations have been erected for the supply of small towns and villages.

Chromium and Tungsten.—The Goldschmidt-Vautin process for reducing the oxides of these metals by means of aluminum, has been worked upon an industrial scale in Germany during 1899. The works are at Essen, and an alloy of chromium and iron for use in the manufacture of chrome-steel is the chief product of the factory. A similar works is to be erected in France.

Copper.—The chief events of 1899 in connection with the refined copper industry have been those connected with the financial position. The price of G.M.B.'s on January 1, 1899, was \$276 per ton. In April the Amalgamated Copper Company was floated with a capital of \$75,000,000, and its operations have kept the price of copper considerably above \$336 per ton for the remainder of the year, the average price of G.M.B.'s for the twelve months having been \$349 per ton. European copper refiners have met with increasing difficulty in obtaining supplies of raw material for their electrolytic vats, and this difficulty has not been lessened by the policy, which since July, 1899, has been adopted by the syndicate, of buying up standard copper in Europe for reshipment to New York.

With regard to those refining processes which aim at the production of copper tubes or sheets the year 1899 has been marked by some changes. The various Elmore companies (with the exception of the French and German companies) have been amalgamated, and fresh capital has been put into the new company. It is hoped that these changes will lead to successful results, the French company which has not been hampered by lack of capital having been very successful. The Dumoulin process. which has now been operated for three years at Widnes, England, is not as successful financially as it was hoped it might be, and no dividend has yet been earned by the company owning this works. Cowper-Coles has patented a third process for the production of copper tubes by electro-deposition, and it is proposed to work it on an industrial scale. The validity of the patents is however challenged by Wilde, and it is possible that, if worked industrially, litigation may ensue.

Dr. Hoepfner has been experimenting many years upon an electrolytic process for extract-



ing copper from its ores. Writing in July, 1899, he informed the writer that this process was then operating industrially at Papenburg in Germany. So many attempts have been made without success to solve the problem of metal extraction by wet electrolytic methods, that further details of the Hoepfner process and trials at Papenburg, will be awaited with in-

Nickel.-Hoepfner has also worked out the details of a process for extracting nickel in a pure state from the new Caledonian ores, and a factory has been erected at a cost of \$240,000 for operation of this process at Papenburg. The plant was started in July, 1899, but no details are yet available concerning the process, or the results obtained.

Sodium.-During 1899 a second factory for the production of sodium by the Castner process was started at Rheinfelden. other factory using this process is situated at Oldbury near Birmingham. For details of this method see Electricity, February 2, 1898.

Zinc.—The Dieffenbach process for extracting zinc from pyrites cinders, which had been operated for several years at Duisburg in Germany, is reported to have been stopped. This is the more suprising as the process was understood to be financially successful. The experimental trials of the Cowper-Coles wet extraction process at Hayle in Cornwall have likewise ceased, and according to the inventor the process is to be operated industrially near London. No details of the new works have however been given to the public, and in view of the failure of the somewhat similar Ashcroft process it is doubtful whether the Cowper-Coles process would prove profitable.

The Swinburne process, which depends upon the electrolysis of a molten bath containing sulphide ore in a state of fusion, is still in its experimental stage, and no industrial trial of this process was made during 1899. The inventor is however still hopeful regarding the prospects of ultimate success. The difficulty of working out an economically successful process for dealing with mixed sulphide ores of the Broken Hill type, has been increased by the development of the Fry process. The process separates the zinc, lead and silver, by ordinary metallurgical treatment, and the large works built by the Smelting Corporation near Manchester, England, for operation of this process, are now working successfully. When complete 2,100 tons of ore per week will be handled at this works.

The Hoepfner zinc extraction process is the only electrolytic process which appears to be in successful industrial operation. It is worked in conjunction with the ammonia soda process, the waste chloride liquors being utilized in this way. Both zinc and chlorine compounds are obtained as products. It has been operated for some time at Winnington in England, and at Huschrau in Austria, and other plants for operation of this process are stated to be in course of erection in Italy, Belgium and France. The zinc works at Duisburg, where the Dieffenbach process was operated, are also said to have been taken over by financiers interested in the Hoepfner process.

There is nothing new to report during 1899, with regard to electro-galvanizing.

The Hamburg-American Steamship Company is said to have appropriated \$150,000 for nine electric cranes to be used in the construction of a new quay at Emden, Germany.

#### A MODERN ENGLISH LIGHTING PLANT

BY FRANK C. PERKINS.

It is interesting to note the great increase of American exports in the electrical industries in the last few years. Every manufacturer

British and German corporations with their largest installations. Among the more recent important foreign installations using American apparatus is that of the Metropolitan Electric Supply Company of London, shown in illustration, Fig. 1. Here it will be noticed are three

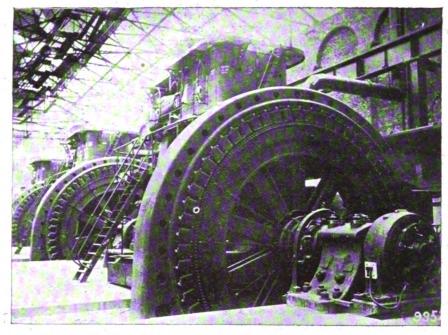


Fig. 1.—View of Three 1,500 K. W. Three-Phase Generators.

the home demand but is reaching out for the

is not only putting forth renewed effort to meet direct connected engines of the vertical compound type and three 1,500 kilowatt generators

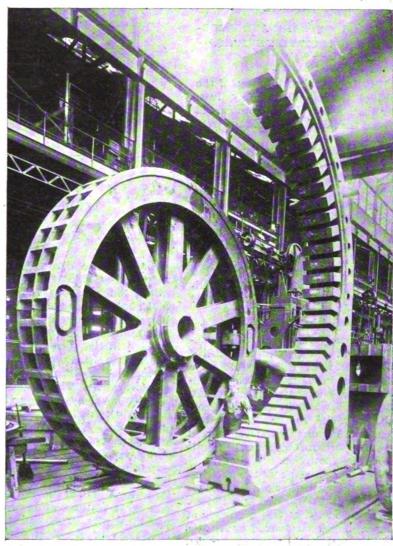


FIG. 2.—VIEW OF FIELD FRAME AND ARMATURE SPIDER.

many of our largest factories are supplying American make. Each alternator delivers 3,000

foreign markets for his products and already of the two phase type. This machinery is of

amperes at 500 volts and is driven at a speed of 130 revolutions per minute, the engines operating at 100 lbs. pressure. The high pressur cylinder is 36" in diameter and the stroke is three feet, while the low pressure cylinder is nearly five feet in diameter. The rated capacity of these engines is 2,500 hp. and the regulation is said to be within one per cent.

The cast iron field frame of the generator may be seen in Fig. 2. The field frame has 62 laminated soft steel pole pieces cast into the frame, which is constructed in two parts and bolted together securely. It will be noted that this construction allows the two halves of the field to be readily separated without disturbing the armature. The fields are carefully wound with insulated copper strips.

The armature spider is built of two castings bolted together and the massive steel rims are bolted to the arms, making a very solid construction. The armature conductors are embedded in slots on the armature ring and consist of heavy copper bars very heavily insulated. and fit snugly into the steel laminated punched cores which are fastened to the rims. These cores are built up to allow a free circulation of air, which holds the temperature at a point not exceeding 33 degrees above the surrounding atmosphere at full load and does not exceed this amount more than 15 degrees even at a heavy overload. Each alternator has its field excited by a 100 volt direct current supplied by a compound multipolar exciter, shown in Fig. 1, and is direct connected to the engine and alternator shaft.

## THE EVOLUTION OF SAFE AND ACCURATE FUSE PROTECTIVE DEVICES.\*

#### BY JOSEPH SACHS.

So much has been said and written of the shortcomings of the so-called safety fuse, that another discussion in this direction would certainly be but the raising of an old and well-known ghost.

With the object of producing a protective device which could lay claim to safety and accuracy in fact and not in name only, the writer began a series of experiments several years ago. As a result of these experiments, a new form of fuse protective device has been developed, which from extensive tests and various kinds of actual service has shown itself safe and accurate. This device is of the so-called enclosed fuse type which in several perfected forms has recently attained particular prominence, and which promises to be the cure-all of fuse difficulties.

Broadly speaking, the name "enclosed fuse" may be applied to any fuse-strip covered, encased or surrounded by a jacket, box or shell of some kind. Considered thus, probably the earliest device used in common practice fulfilling these conditions is the now famous Edison fuse plug, Fig. 1, whose tremendous success is unquestionably due to the facility with which it can be manipulated and the partial protection of the surroundings from the resulting effects of fuse disruption.

The value of such encasing of the fuse was fully appreciated even earlier than this, as is shown by a patent to Edison, Fig. 2, in 1880, which may be considered as the beginning of enclosed fuses. Fuses surrounded by asbestos wrappings, close-fitting rubber tubes, threaded through and placed between blocks of insu-

lating material, and placed in two-part blocks which formed practically a casing around the wire have followed. [See Figs. 3, 4 and 5.] For use on high potentials, a variety of fuse cutouts have been used in which the fuse wire is placed in a hollow handle or holder of insulating material and equipped with terminal pieces to which the fuse wire is removably connected, and so constructed that the arc resulting from the blowing of the fuse is more or less destroyed by various mechanical arrangements or blown-out by the rush of the air in the handle to the exterior, as shown in Fig. 6.

The name "enclosed" or "cartridge fuse" is, however, to-day particularly applied to fuses in which the fusible strip is placed inside of a tubular holding sheath or jacket which is filled with some yielding porous or similar material through which the fuse wire is threaded, and which more or less fills the space between the wire and inside of the tube. The wire, tube and filling are made one complete self-contained device with suitable terminals at its ends. Such jacketed and insulated fuses possess peculiar features. The jacket if properly designed gives to the very deficient fuse the essential accuracy and safety aside from various other desirable additions.

conditions governing the protection of electrical apparatus from excess current, the particular manner in which this new form of fuse protector fulfills these conditions, and the relative advantages of each of the two types.

GENERAL PRINCIPLES OF EXCESS CURRENT PROTECTION.

An abnormal current existing in an electrical appliance tends to cause injury and damage due to heat, sparking and mechanical and electrical strains and effects, either on the part of the electric apparatus itself or its driving or driven machinery. In the first two, the duration or time interval of the injurious effect enters into the resulting damage or injury as a direct function. The third effect may in some cases cause injurious results in so short a time interval that its action may be said to be almost instantaneous under certain extreme conditions of abnormal current flow.

All electrical apparatus is intended to, or should carry a normal load current without any injurious effects indefinitely, and it will carry an excess current for a time interval depending inversely on the amount of excess above the normal current before sufficient energy has been transformed to produce injury. Slight momentary rushes, or an excess current



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Fig. 1.—Edison Fuse Plug.

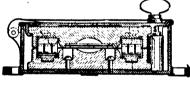
Fig. 3 -Soft Rubber Tube Fuses.





Fig. 2.—Edison Enclosed Fuse. Patent of May 4, 1880.

Fig. 4.—Fuse in Center of Close Fitting Insulating Cylinder.



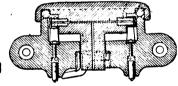


Fig. 5.—Fuse encased between, two Insulating Blocks.

Fig. 6.—Fuse in Centrally Vented Holder.

At the present time enclosed or cartridge fuses may be divided into two distinct types, both of which embody the same general elements, but differ in their disposition. In both, an enclosing tube entirely encases the fuse, and a filling material of the character named is placed in the tube around the wire. The difference in these two types simply consists in the composition and arrangement of the filling around the fuse. The simplest form is probably that in which the filling entirely surrounds the fuse wire, and completely fills the interior The other form involves the of the tube. arrangement of the filling material around the wire so as to leave a portion of the fuse uncovered thereby, and surrounded by an air-chamber usually located about centrally in the tubular casing. Both of these types inherently possess great features of advantage over an exposed fuse wire. Their operation under various conditions of electrical service is, however, generally governed by the same basic, electrical and thermal laws. The features inherent in each have received careful study and investigation, and this paper is intended to discuss the of short duration will not cause injury to the apparatus if the total energy developed is within the excess limit of the apparatus. Such changes in the current conditions occur, however, in a very large percentage of electrical apparatus and to open the circuit in these cases every time this occurs without taking cognizance of the time of its existence, is a fallacy unless governed by conditions other than the protection of the electrical apparatus from the abnormal current.

For the protection, therefore, of the electrical apparatus alone without regard to other conditions which may affect its operation, an excess current protective device fulfills every condition if it possesses the following features:

- 1. A definite, unchangeable maximum continuous running current-carrying capacity.
- 2. A constant definite energy overload capacity depending inversely on the overload, and adjusted with the allowance of a reasonable safety factor for the apparatus to be protected. In this respect the protective device should be like the apparatus protected, uninjured by an excess of momentary or shorter du-



<sup>\*</sup> Abstract of paper read at the 141st Meeting of the American Institute of Electrical Engineers, New York, March 28, 1900.

ration than the time interval causing injury. In other words, it should simply be a device whose factor of safety is less than the device to be protected, but whose operation is based on the same general principles. It must, therefore, operate practically instantaneously on short-circuit and in a time interval inversely dependent on the amount of ordinary overload.

3. Its operation should be safe under any condition of abnormal current at the voltage for which it is intended. No device can be universally safe in its self-contained form unless the arc and explosive effect coincident with the rupturing of the circuit under any condition is entirely suppressed. The device should not only prevent damage to extraneous surroundings but should be non-destructive to all connected parts other than those directly operative.

FEATURES OF THERMAL CUT-OUTS IN COMMON

Notwithstanding many statements to the contrary, no similar electrical device is based on simpler, or even as simple operating principles as the thermal cut-out, as it may properly be called. The generation of heat in any current-carrying conductor is a well understood phenomenon. The rise of temperature in this conductor, due to the heat energy imparted to it, is governed by well-known conditions. If these conditions could be made fixed instead of constantly varying quantities, accuracy and certainty of action would result.

The heat energy imparted to a section of conductor by a certain current flowing for definite time is a fixed quantity. The temperature attained in this conductor depends simply on how much of this heat energy is thrown from the conductor during that particular time interval. It is entirely obvious even without the various experimental investigations on this point, that any condition that varies the amount of heat energy taken from the conductor, varies the temperature attained, and hence the carrying-capacity of the conductor, since the melting of the metal is dependent thereon. The several ways in which this heat is dissipated from the ordinary air-exposed fuse conductor is entirely familiar to all electrical engineers but fuses always have been, and, are now, and in the case of open air fuses, probably always will be used indiscriminately without regard to these simple facts, and vet constancy and accuracy are expected.

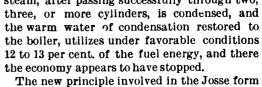
Perhaps even more serious, however, than accuracy is the lack of safety in the ordinary exposed fuse. On this score a multitude of transgressions are heaped up against fuse devices of such types as have been in use a dozen years on nearly all classes of high and low voltage services. No exposed fuse is safe, considered from the standpoint of fire hazard to its surroundings. The destructive and dangerous arcing of all exposed fuses when ruptured by excess current and particularly short-circuit conditions at the higher potential must be entirely and not partially eliminated before the fusible cut-out can be considered a perfectly satisfactory protective device. Even when a fire-proof housing is provided, safety is not absolutely assured. This serious objection to all open fuses is becoming more rather than less serious in its aspects in view of the introduction of higher potentials and enormous generating capacities.

Possessing inherently extreme structural simplicity, and involving an operative principle, not only due to the amount of current but also the time of its duration, the fusible cutout need only have added to it elements that will standardize the varying conditions which now beset it in service, and effectively eliminate the injurious arcing.

GENERAL FEATURES AND DESCRIPTION OF EN-CLOSED FUSES.

If the length of the fusible conductor is definitely fixed, the terminals properly proportioned so that the heat conduction from the fuse through them is correctly adjusted, and the fuse then protected from moving air currents and placed in an environment which cannot affect its action as to fusing, and which has a definite capacity for heat reception from the fusible strip, then some of the variable factors affecting the reliable action of the fusible conductor become fixed and the rise of temperature in the fusible strip for a certain current can be quite definitely relied upon.

Perhaps the very simplest arrangement embodying these elements comprises a definite length of insulating tubing entirely enclosing a fusible wire which is centrally fixed therein and surrounded throughout its length by the tube enclosed air, as shown in Fig. 7. Such an arrangement fixes the length, terminals and environment, but it still gives us only an air



of engine has made possible a return of power for fuel consumed which has heretofore been entirely impossible in steam engines. Already a large company has been formed in Berlin for exploiting the new principle and three of the largest electrical works in that city are expected soon to install engines of this type.



Fig. 7.—Air Filled Tube Fuse.

surrounded wire with the disadvantages of air surrounded fuse wire and by no means produces a device which will operate on severe conditions of abnormal current flow without serious explosive effect. It is true that such fuses in very small ampere capacities, inside of two or three amperes, and at low voltages can be made to work successfully without explosion, but even then the tube must be strong if it is desired to withstand severe short-circuit without disagreeable external manifestations.

A casing might be constructed of sufficient strength, to withstand the pressure of the interior explosion and by a slight leakage arrangement allow the confined gases to gradually escape, but the practical limitation would soon be reached with fairly large current capacities at moderate or high service voltages. Various tests have amply demonstrated this.

By a very simple addition, shown in Fig. 8, we can greatly improve the operation of the device as far as explosion and bursting of the tube is concerned. If the tube is entirely filled with some finely divided insulating material, such as powdered chalk, the heat due to disruption of the fuse wire, instead of giving rise to an abnormal pressure in the enclosing tube by the heating and expansion of the enclosed air, will be largely taken up by the filling. The small remaining volume of air in expanding passes through the interstices of the filling and parts with more or less of its heat that would otherwise give rise to a destructive pressure. Larger capacity fuses will require firmly held end closures and vents somewhere in the enclosing shell, so that gases may escape from the tube. While the arcing of the enclosed fuse has been cured, the results due to the holding of the metal in a molten condition by the oxide film have been aggravated instead of relieved. The firmly packed filling around the wire serves as a secure bed for the melted metal and its oxide film, relieving it of all supporting strain and maintaining it in continuity although entirely in a molted condition

(To be continued.)

#### UTILIZATION OF EXHAUST STEAM.

Considerable comment has been aroused in all parts of Germany by the surprising results attained by Prof. E. Josse of the Royal Technical High School, at Charlottenburg, with the use of exhaust steam for the generation of power.

It is, of course, well known that the ordinary simple high-pressure engine which, after passing steam through one cylinder, discharges it into the air, utilizes hardly more than 5 per cent. of the value of the fuel consumed under its boiler. The compound engine in which the steam, after passing successfully through two, three, or more cylinders, is condensed, and the warm water of condensation restored to the boiler, utilizes under favorable conditions 12 to 13 per cent. of the fuel energy, and there

Fig. 8.—Chalk Filled Solid Packed Fuse.

A complete and what appears to be an accurate non-technical description of the experimental engine employed at Charlottenburg has been transmitted to the State Department by United States Consul-General Frank H. Mason of Berlin. From this report it appears that the process is the joint discovery of Mr. G. Behrend, a Hamburg engineer, and Dr. Zimmerman, Ludwigshafen; and, although first patented in 1889, it has only recently been matured and its application perfected by the employment of an auxiliary engine, which, utilizing the heat contained in the exhaust steam, gains as high as 56 per cent. additional motive power without increasing the expenditure of fuel. The principle and process involved are simple and Mr. Mason describes them as follows:

It is plain that, with all progress which has hitherto been made in steam-engine practice through higher pressures, superheated steam, economical cut-offs, or successive cylinders, there is always an important and inevitable loss of heat energy when the steam, having done its work, is discharged into the open air or changed back to water by contact with cold water in a condenser. When the exhaust is into the open air, the steam has a temperature of about 100° Celsius (212° F.), when it passes into a condenser, the steam has a temperature of 60° to 70° Celsius (140° to 160° F.), according to the vacuum. The corresponding latent heat of steam, given up upon change of form from steam to hot water, has hitherto run to waste in the condensing or cooling water, or in the air. Messrs. Behrend and Zimmerman attacked the problem of utilizing this wasted caloric by employing it to create a new supply of steam by evaporating some liquid which has a lower boiling point than water, and for this purpose they chose, after many experiments sulphurous acid, which is not only cheap and easily obtained, but has the further advantage

<sup>\*</sup> From the "Manufacturer," Philadelphia.



of a viscous consistency and lubricates the inner working surfaces of the machinery without corroding them. Their demonstrations, although not practically conclusive, were so promising that Prof. Josse, as a technical authority on this subject, took up the problem, and, after several months of highly satisfactory laboratory experiment, caused to be constructed and connected with an ordinary working steam engine, of the compound type an additional condenser and auxiliary engine, the power of which could be exactly measured.

The engine employed in these experiments was an ordinary compound engine with a stroke of 500 millimeters (19.69 inches) and a speed of 41.5 revolutions per minute. In the engine as altered for the new process, the exhaust steam is made to pass from the low-pressure cylinder into a surface condenser, called the "vaporizer." In this vaporizer or condenser, the cooling medium used, instead of water, is liquid sulphurous acid, which has a boiling point so low that it is immediately decomposed by the heat of the exhaust steam, whereby the sulphur dioxide gas is liberated, which passes over into the cylinder of an auxiliary engine, where its work is done as in an ordinary steam engine. The auxiliary cylinder has a diameter of 300 millimeters (11.81 inches) and a stroke of 500 millimeters, with a speed of 77 revolutions per minute.

After passing through this cylinder, the sulphurous vapor enters the surface condenser, around the tubes of which cold water flows as in an ordinary steam plant. Here the sulphurous vapor is condensed to liquid and is forced by a pump back into the vaporizer, where it begins its cycle again, the same surphur dioxide being used over and over again indefinitely There are, therefore, in fact, two condensers, the first serving, as it were, as a boiler or steam generator for the auxiliary engine; and this boiler, instead of being fired by coal, obtains all its heat from the exhaust of an ordinary steam engine, and, instead of converting water into steam, evaporates a liquid which is much more volatile—i. e., has a far lower boiling point.

In the long series of recorded tests with the plant, the following results were attained:

The steam engine is of the compound type, of good, modern construction, and, being given a steady load, developed 34 indicated horse-power, with a consumption of 8.6 kilograms (18.96 pounds) of steam per indicated horse-power hour. The auxiliary machine working with the sulphurous vapor indicated 19 horse-power—that is, an increase of 56 per cent., and yielding, instead of 1 horse-power, 1.56 horse-power for the same steam consumption and reducing the steam consumption from 8.6 kilograms to 5.5 kilograms (from 18.95 to 12.13 pounds) per indicated horse-power.

The experiments showed on the average that for every 15 kilograms (33.169 pounds) of steam passing through the main engine, 1 horse-power could be gained in the auxiliary machine. Applied, therefore, to an ordinary single-cylinder steam engine, exhausting into the air at high temperature, the percentage of power saved by this new device would be very much higher than the economy reached in these experiments, which, as has been shown, were made with a highly-improved compound engine. From the average of these experiments, it may be broadly stated that, given a fairly economical compound engine, using 74 kilograms (16.5 pounds) of steam per indicated horsepower hour, half an indicated horse-power

could be produced in the auxiliary machine for every indicated horse-power developed in the main engine.

The expense of this improvement is practically all in the construction cost of the vaporizer, condenser, and auxiliary engine itself, and its economy may be realized from the fact that the exhaust steam from a 2,000 horse-power central station engine should furnish power to drive an additional 1,000 horse-power engine, which can be connected as an extra cylinder to the steam engine or run independently, and thus increase by 50 per cent. the power developed without adding a pound to the quantity of fuel consumed.

#### THE PARIS EXPOSITION.

#### Production of Electrical Energy.

(Special Correspondence of Electricity.)

The electric energy required for the many uses of the Exposition will be produced by condensing steam engines directly coupled by a common shaft to the generating dynamos, and to the exclusion of all transmission by means of pulleys, belts, etc.

The necessary steam for these engines will be supplied from two boiler houses, situated just in front of the former Machinery Hall. The Suffren boiler house contains boilers of foreign manufacture, while the Bourdonnaise will obtain whatever awards the international examining jury may consider their due.

Each generative set will be provided with a suitable switchboard and protective appliances, such as the administration of the Exposition requires. The electric current will be delivered at the switchboard under a definite and even tension as follows: Continuous current 240 to 480 volts at the main switchboard; simple alternating current, 2,200 volts, frequency 50; two-phase current, 2,200 volts, frequency 42.5; three-phase current, 2,200 3,000 and 5,000 volts, frequency 50 to 42.

The administration, assisted by the exhibitors' employes, will at once proceed to make tests to determine if the steam and electric generators are suitable for furnishing the normal power required for the different places. A record will be kept of these tests, and further tests may be made at any time during the Exposition.

There are 38 groups of electric generators, 19 of these belong to the French section, and a like number in the foreign section.

The total output of the 38 groups of generators, is 20,245 kilowatts.

The two following explanatory tables give the names of the groups to be found in the right and left hand galleries of the Electrical Building, in the two Machinery Halls, in front of the Banquet Hall, and on a part of the ground floor of the Electrical Building:

TABLE I.—ELECTRO-GENERATORS IN FRENCH SECTION.

The	Names of Builders.		Maxi-		Maxi-	Maxi-	ency.
order.	Steam Engines. Dynamos.	I. H. P.		Current.	output in am- peres.	mum voltage	Frequency
3 bis. 4 5 6	Societe Alsacienne de Constructions Mechaniques Crepelle et Garand Societe Turbine de Laval Societe Turbine de Laval Maison Breguet Compagnie de Fives-Lille Compagnie de Fives-Lille Compagnie de Fives-Lille Compagnie de Fives-Lille Compagnie de Fives-Lille Compagnie de Fives-Lille Compagnie de Fives-Lille Compagnie de Fives-Lille Compagnie de Fives-Lille Compagnie de Fives-Lille Compagnie de Fives-Lille Compagnie de Fives-Lille A Grammont Establissement Postel-Vinay Societe l'Eclairage Electrique Societe l'Eclairage Electrique Pe et A. Farcot Pe et A. Farcot Pe et A. Farcot Pe et A. Farcot Cie tenerale Electrique Nanc Weyher et Richemond Delaunay-Belleville Maison Breguet Cie Thomson Houston Schneider et Cie Societe Anonyme Hauts-Fourneaux Maubeuge (Moteur a gaz Charon) (Cie Generale Electrique Nanc	1200 300 300 1200 600 400 135 e. 800 1000 1000 1000 1250 1200 1200 1200 1200 1200 1200	675 675 170 170 675 340 225 75 440 190 480 560 240 560 2560 700 675 840 65	Direct. 3 phase. Direct. 3-phase. Direct. 3-phase. Direct. 4-phase. Direct. 3-phase.	1850 2700 680 680 90 450 150 95 760 52 2240 52 150 65 230 1120 260	500 250 250 250 250 2200 500 500 250 250	  50 50  50  50  50 50  50 50 

TABLE II.—ELECTRO-GENERATORS IN FOREIGN SECTION.

der.		Names of	Builders.		Maxi-		Maxi-	Maxi-	ency
Theor	Nationality.	Steam Engines.	Dynamos.		output in K.W.		output in am- peres.	mum voltage	Frequ
24 F	dolland Holland Hermany	Willans et Robinson	Mather et Platt Electrotech Ind Hel. Elek. A. A. Gess Schuckert	500 2400 500 500 1900 2000 2230	280 1340 280 300 1020 {1120 1250 785	Direct.  Alterna'g  Direct.  B-phase  Direct.	1120 2680 1120 600 480 (1600 1 100 340 (1400	250 500 250 500 2200 2200 5000 2500 250	50 50
30 31 32 A 33 34 F 35 S 38 39	Gelgium  Austria,  Hungary  Switzerland  taly	Carels. Bollincks Van der Kerchove Ringhoffer. Erste Brunner Lang. Sulzer Escher-Wyss	Kolben Electricite et Hydraul Pieper. Siemens et Halske Ganz Ganz Ateliers d'Oerlikon Ateliers d'Oerlikon Alioth Schuckert	1000 1100 1100 1600 910 1200 400 900 360 1200 600	560 620 560 900 510 670 250 600 675	3-phase  Direct. 3-phase.  Alterna'g 3-phase. Direct.	150 150 170 150 1800 140 180 110 135 400 1350 700	5000 3000 2200 2200 2200 2200 2200 2200 2300 500 500 500	50 50 42 50  43 50 50 50

boiler house will contain boilers of French manufacture. The steam in the main conducting pipes, will have an effective pressure of ten kilograms per square centimeter. This pressure may vary by at least 10 per cent.

The generating sets for these purposes will be considered as exhibits, and governed by the same general rules as other exhibits, and they The 37 steam engines give a total of 36,035 indicated hp., to which we must add 120 hp. from Charon gas engines, which furnish power for the dynamos in group 17, and are especially installed to supply the requirements of the temporary sewer system.

The current distribution is as follows:

First—Continuous current, 19 groups, total

8,160 kw. Included in this total are the 750 kw. continuous current furnished by the dynamos, Nos. 26 and 28.

Second—Simple alternating current, 2 groups, total 1.270 kw.

Third—Two-phase current, 1 group of 480 kw.

Fourth—Three-phase current, 17 groups, total 10.335 kw.

Grand tetal, 20,245 kw.

A division of the generator groups by nationalities, give results as follows:

France	19	group	8	8,075	KW.
Germany	4			4,175	**
England	8	**		1,900	**
Belgium	3	**		1,740	**
Austria				1,410	**
Italy	2			1,025	**
Switzerland	3			950	**
Hungary	1	**	• • • • • • • • • • • • • • • • • • • •	670	• •
Netherlands	1	"		800	
Grand Total	. <b></b>			20,24	- 5 ··

All the electric energy produced by the above groups are devoted exclusively to furnishing electricity for general lighting, power, and freight and passenger elevators.

Power to be used for special lighting, special enterprises, and for restaurants, theaters, and other public places, will be furnished by the Compagnie du Secteur de la Rive Gauche, and by the Compagnie du Secteur de Champs Elysée, or by other private companies, to which is given the privilege of furnishing a maximum of 120 hp. for driving motors and which are included also subsidiary motors. Those which are running simultaneously must not exceed 60 hp.

The moving platform which is about 4,000 meters long, and encircles the Exposition grounds, and a parallel electric railroad, which will carry passengers in an opposite direction, will receive their electric power from an electric station of the Compagnie de l'Ouest, which has recently built a station at Moulineaux-Billancourt for its new line to the Invalids.

The primary three-phase alternating current of 3,000 volts, will end at a transformer substation, situated on the Quai d'Orsay, which contains two groups of rotary transformers of 600 kw. and two commutating machines of 600 kw. The tension of the continuous current, furnished by these last machines will be 500 to 550 volts.

The above is a resume of the means taken to furnish the Exposition with electric energy for the many diverse purposes.

## Plans for a National Highway.

At the first banquet of the Automobile Club of America, held last week at the Waldorf-Astoria in this city, the plan of a national highway from the Atlantic to the Pacific was formally launched and a definite route was annouced. The plan as read by Col. Pope, of Boston, provides for a highway along the Eastern coast from St. Augustine to Portland, Me., and on the Western coast from Los Angeles to Seattle. The main highway, however, will be from New York to San Francisco, passing through Chicago, St. Louis, Kansas City, Omaha and Ogden. Congress will be asked to appropriate one-third of the expense, the States through which the roads pass one-third, and the counties, townships and cities through which it goes the other third. Owners of property benefited will be asked to donate the right of way. The road is designed to be 120 feet in width and in a perfectly straight line.

#### Electric Floats.

The sixteen electric floats built in New Orleans, La., at a cost of \$42,000 have been sold to Denver for an exhibition there, and from Denver they will be sent to Wichita, Kan., for the next street fair to be held early in October.

They are the first and only electric floats ever built in the world and one of them named "The Era of Electricity," is said to be so dazzling that one cannot stand within fifty feet of it and look at it without injury to the eye. This float alone cost \$7,000.

These floats are built on car trucks provided with motors, which are operated the same as those on trolley cars by current taken from an overhead conductor.

On the occasion of the opening parade of the New Orleans carnival, February 21, the floats were all mounted on trucks and were driven by the overhead trolley system. While the feasibility of thus employing electricity for light and motive power in carnival parades has often been discussed, it was never before attempted. To the spectators the tableau moved along without any apparent motive force. The controller and brake were placed in the forward part and the trolley pole towards the rear. Each car was equipped with a controller and a switch to control the lights. It tested the ingenuity of the deviser to conceal the motorman and so disguise the trolley pole that it would not be recognized. It was a difficult piece of work especially on account of the radical difference of all the tableaux, but it was accomplished admirably. Due regard had to be exercised as well to give the men ample room to work in and to see ahead. Though each tableau had a cave in front and a larger one to the rear, the designer comprehended this so cleverly that its purpose was altogether lost in the general effect. In the case of Nereus, for instance, the motorman was concealed in the head of the fish, and a small and inconspicuous aperture gave him full opportunity to see ahead. The trolley pole was hidden by several sea gulls in flight. In the car showing the burning of the Templars the motorman was concealed in the flames, while the trolley pole was a huge tongue of flame which swayed to and fro.

#### A Telegraph Pole Climbing Contest.

During the recent military tournament, held in Madison Square Garden of this city, an ininteresting telegraph pole climbing contest took place between the First and Second Signal Corps of the National Guard of New York State. The prize consisted of a handsome silver loving-cup, made by Tiffany & Co., and bearing the inscription: "1900. Military Athletic League Signal Service Contest, Madison Square Garden, New York."

Six poles were furnished as nearly uniform as possible and erected rigidly in a vertical position. Each pole had a spike driven in one side at a point thirty feet from the base. The contest consisted in placing numbered cards on the spikes on the poles under the following terms and conditions previously agreed to:

"Each corps to be represented by a team of six enlisted men who have been members of their respective organizations at least two months and whose daily employment does not include pole-climbing. The contest to consist of three heats of three minutes each, the team winning two heats to be adjudged the winner of the contest and to be awarded the trophy.

"At the signal to start, the contestants to

take the numbered cards from a table, one at a time, and place them on the spikes on the poles of their respective teams, climbing the poles for the purpose and descending to the ground each time a card is so placed. At the signal to stop the team having the greater number of cards hanging from its spikes on the poles to be the winner of the heat."

Both, heats which occurred on March 27 and March 31 respectively, were won by the team representing the First Signal Corps, which in so doing demonstrated how rapidly work of stringing wires could be carried on in the field.

#### LONDON NOTES.

[From our London Correspondent.]

#### Gas-Driven Electric Plants a Failure.

The experience of Morecambe, Belfast and Coatbridge, which some years ago installed producer-gas driven electric lighting systems, which after a short time were found to be unsatisfactory, is now being repeated in two other more modern stations. We refer to Leyton, where a municipal plant has been operating for three or four years, and at Lynn in Norfolk, where the works only commenced running last autumn. The Leyton plant was described in Electricity at the time, and the Lynn equipment was very similar, although it was supposed to have been planned so that any troubles which had shown themselves at Leyton might not appear at Lynn. At neither of these stations are gas engines to be employed for extensions; in fact, owing to such matters as vibration and other nuisances, high costs. the use of numerous small units, rope driving and so on, it is quite possible that abandonment of the present installations will be decided upon-if not in both towns at least at Leyton.

## Tenders Wanted For Electrical Plant.

The Corporation of Dublin is proceeding with a very extensive scheme for adding to its electric lighting system. Tenders are being invited until April 26 for the following: Six Lancashire, four water tube boilers and two economizers; two 1,000 kw. and two 500 kw. low-speed polyphase generators.

### LEGAL NOTES.

Judge Vinje's recent decision in the case of Harrigan et al., against the National Electric Manufacturing Company of Eau Claire, Wis., and thirty other defendants has been filed. The plaintiff's claim aggregated about \$280,000, based on an alleged fraudulent issue of stock. The court finds that the stock divided was issued in good faith. The result of the findings is that a larger number of the defendants get judgment, dismissing the plaintiff's complaint, while as to the defendants affected by the court orders set aside, judgment is entered against such defendants jointly, aggregating \$38,844.40 with interest.

Judge Simonton, of Harrisburg, Pa., has handed down an opinion which is exceedingly important to all street railway interests in that State, his conclusions of law being as follows: "First—That neither the Pittsburg & Birmingham Passenger Railway Company nor its lessee, the Pittsburg & Birmingham Traction Company, has the exclusive right to use and operate a street passenger railway on and over the Smithfield street bridge. Second—That the Sycamore Street Railway Company has a legal right, with the consent of the proper municipal authorities and the bridge company, to use and operate a street passenger railway on and over the Smithfield street bridge."



#### CANADIAN NOTES.

(From our Ottawa Correspondent.)

It is said that the Preston & Berlin Street Railway Company will build a line between the towns of Berlin and Preston, Ont.

The Electric Street Railway Company of Montreal complains that the adoption of the new two-minute time schedule by the city council will seriously embarrass the company. Mr. Wanklyn, the general manager, emphatically asserts that his company does not possess sufficient cars to run a two-minute service on many of the streets. It will not be possible, in his opinion, to give the increased service, unless the company is allowed to construct conduits for the transmission of in-creased power. The question of the conduits opens up an important consideration for the Roads Committee of the council, and, in order that the members of that body may the better understand the conduit system, they have decided on a trip to New York for an inspection of the conduits in use in that city.

Of the utmost importance to the thousands of investors in Toronto Electric Street Railway shares, is the scheme of the mayor of Toronto providing for the laying down of alternate lines. The mayor, in effect, claims that the only way to prevent the nuisance of overcrowding cars is to lay out a system of track extensions, to ask the company to construct these parallel lines, and, in default, call in a new company and permit it to build on streets designated by the council. Eight new routes, involving the laying of tracks on 139 streets, are outlined in the plan. The mayor's critics assert that the chief purpose of his alternative scheme is to aid the Metropolitan, a suburban electric railway, to get an entrance into the city, independent of the Toronto Electric Railway.

The street railway by-law that has been before the town council of Niagara Falls, Ont., for some time, granting the Sutherland Construction Company of New York a franchise to convert the old Niagara Falls, Wesley Park and Drummondville horse car line into an electric system, has finally passed the council. The franchise extends the old franchise fourteen years, making the life of the new franchise twenty years from date. It gives the company exclusive rights over specified streets, and five months' option on all other streets within the municipality. All electric trunk lines, after receiving permission of the town council to enter the municipality, can use the tracks of the local company less than one mile, the remuneration, failing amicable traffic arrangements, to be settled by arbitration. Mr. Grindel, of New York, solicitor of the Sutherland Construction Company, considers the franchise no more than a fair working the provides the grant level allocative line should franchise than any local electric line should receive, and it is altogether likely that his company will proceed at once with the conversion of the old horse car line into an electric sys-

The Hamilton, Grimsby & Beamsville, Electric Railway extends for twenty-three miles eastward of Hamilton, Ont., and every mile of its length is through a veritable garden. No more attractive trip can be found in Canada. The line carried, last year, 2,000 tons of fruit in baskets, and 4,500 tons of fruit and other products as freight, being the best return in three years.

Mr. S. S. Dickinson, superintendent of the Commercial Cable Company at Ganso, Nova Scotia, has gone to the Island of Fayal, in the Azores, to arrange for the reception of the company's German cable, which will land there. When completed, the cable will make a direct connection between New York and Germany Six hundred miles of this cable has just been

completed off the coast of Nova Scotia, and the object is now to begin paying out the cable from the Island of Fayal and running northwestward until a connection is made with the part referred to off the Nova Scotia shore. The steamer Faraday is now on her way to England, where more cable will be taken on, which will be used in making the connection. It is expected that this new link of the Commercial Cable Company will be completed in about three months' time, and when finished will make the fourth cable belonging to this company which crosses the Atlantic.

#### PERSONAL MENTION.

Mr. Thomas Glenn, superintendent of the Wetmore Electric Light Company of Lowville, N. Y., was instantly killed near New Bremen a short time ago by grasping a live

Mr. J. Kajulra, an expert electrician, recently sent by the Japanese Government to secure information about telegraphs and telephones, is now in this country He also desires to obtain information regarding electric street railway systems, as the introduction of electric tramways is now contemplated in Tokio, and in some of the larger Japanese cities in which they have not yet been introduced.

Mr. Henry Hine, who has been general manager of the Stapley Electric Company, of Pittsfield, Mass., since its incorporation in 1891, has resigned his position, to take effect May 1. Mr. Hine will move with his family to Colorado Springs, Col., where he has extensive electrical interests, which will receive his entire attention.

Mr. Gustav Schimpff, of Berlin, Germany, royal Government engineer, recently came to New York, and has been spending a few days in studying the electric system of Buffalo, N. Y., and the electric power houses of Niagara Falls.

Mr. Alexander Nebel, a Chilian employed at the General Electric works at Lynn, Mass., has been selected to represent the company's lamp department at the Paris Exposi-

Mr. B. Otis Danforth, for a number of years superintendent of the Cambridge (Mass.) Electric Light Company, has resigned his position with the company. He will take up his residence in Lebanon, Me.

#### Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended April 7:

Amsterdam, 11 cases, \$1,437; Antwerp, 72 cases, \$4,744; Argentine Republic, 49 cases, \$6,-528; Barcelona, 12 cases, \$528; Brazil, 33 cases, \$1,716; Bremen, 2 cases, \$27; Bristol, 109 cases, \$50,000; British East Indies, 113 cases, \$5,832; British West Indies, 17 cases, \$509; Central America, 14 cases \$412; Chili, 38 cases, \$2,546; China, 31 cases, \$1,127; Cuba, 876 cases, \$7,722; Dublin, 77 cases, \$20,855; Florence, 4 cases, \$42; French East Indies, 5 cases, \$123; Glasgow, 210 cases, \$3,919, Japan, 223 cases, \$6,029; Liverpool, 97 cases, \$6,816; Mexico, 49 cases, \$3,741; Porto Rico, 33 cases, \$1,070; Southampton, 5 cases, \$110; Stockholm, 1 case, \$115; U.S. Colombia, 4 cases \$73; Vienna, 2 cases, \$57.

### INCORPORATIONS.

The Knoxville Power Company, Knoxville, Tenn -to manufacture electricity for lighting and power. Capital stock, \$10,00). Incorporators: J. T. Wilder, R. W. Austin, T. B. Cormick, J. M. Murphy and S. R. Morrow, all of Knoxville.

The City Lighting Company, St. Louis, Mo. This company is the active agent of the Seckner Contracting Company, which was the successful bidder for the contract for lighting the business district of the city for ten years. Capital stock \$600,000. Stockholders George Mayer, M. C. Bergman, E. M. Tyner and John H. Brown.

The Dr. Spaulding Electric Belt Company, Syracuse. N. Y. Capital stock, \$100,000. Directors: Samuel J. Spaulding of Canton, O.; J. N. Willard and B. P. Wright of Syracuse.

The Merchants' & Manufacturers' Electric Light, Heat & Power Company, Pittston, Pa.—to supply light, heat and power. Capital stock. \$10,000. Incorporators: W. F. Hallstead, E. M. Stack, M. W. Collins, G. M. Hallstead and F. C. Hand, all of Scranton.

### ELECTRICAL PATENT RECORD.

This department is edited by OSCAR A. MICHEL. Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N W, Washington, D.C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents Trade Marks. Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL. Nos. 302-304. Broadway, New York City. N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.

#### LETTERS PATENT ISSUED APRIL 8, 1900.

ELECTRIC RAILWAYS AND APPLIANCES,
646,460. Trolley, William B Potter, Schenectady, N. Y.,
assignor to the General Electric Company of New York,
Filed Dec 14, 1898.
646,626. Surface-Contact Railway System. Gustav Paul,
Munich, and Heinrich Wriggers, Augsburg, Germany,
Filed Aug. 11, 1899.
646,768. Controlling, Apparatus for Electric-Railway Cars.
August Sundh, Yonkers, N. Y. Filed Sept. 25, 1899.
646,889. Controller for Electric-Railway Cars. August Sundh,
Yonkers, N. Y. Filed Dec. 23, 1899.

FORKETS, N. Y. Filed Dec. 23, 1899.

ELECTRIC LIGHTS AND APPLIANCES.

646,734. Branch or Lamp Switch. Ernst Liebscher, Nuremberg, Germany. Filed Dec. 22, 1899.

646,839. Service-Switch for Electric Lighting Systems, George O. Kelly, Cambridge, Mass. Filed Nov. 20, 1899.

646,833. Electric Arc Lamp. Peter H. F. Spies, Yonkers, N. Y., assignor to Charles G. Durfee, same place, and Louis A. Rodenstein and Neil Ambrose Flannery, New York City Filed Nov. 1, 1899.

ELECTRICAL MACHINERY AND APPARATUS.
649,418. Machine for Generating and Utilizing Static Electricity. West Dodd and Alvin D. Struthers, Des Moines, Iowa. Filed July 14, 1899.
646,467. Motor Frame. Sidney H. Short. Cleveland. Ohio, assignor. by mesne assignments, to the Westinghouse Electric & Manufacturing Company. Pittsburg, Pa. Filed Oct. 15, 1898.

Oct. 15, 1898.
646.590. Electric Transformer. Walter S. Moody, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Aug. 27, 1897.
646.526. Electric Controller. John C. Lincoln, Cleveland, Ohio. Filed July 24, 1899.
646.649. Electric Metal-Working Apparatus. Charles L. Coffin, Detroit, Mich. Filed May 13, 1899.

TELEPHONES AND TELEPHONE APPARATUS.

TELEPHONES AND TELEPHONE APPARATUS.
646,643. Instrument for Measured-Service Telephones.
Charles E. Gierding. West Haven. Conn., assignor to the
New Haven Car Register Company, New Haven, Conn.
Filed April 4, 1899.
646,675-446,677-646,679-646,681-646,682-646,683. Telephone-Exchange System. Edward E. Clement, Washington, D. C.,
assignor to the Sun Electric Manufacturing Company of
New Jersey. Filed June 16, 1898, Dec. 21, 1898, April 21,
1899.

New Jersey. Filed June 10, 1080, Dec. 21, 1005, April 21, 1899,
646,676. Combined Annunciator and Spring-Jack. Edward E. Clement, Washington, D. C. assignor to the Sun Electric Manufacturing Company of New Jersey. Filed June 16,1898.
646,678. Telephone Transmitter. Edward E. Clement, Washington, D. C. assignor to the Sun Electric Manufacturing Company of New Jersey. Filed Aug. 20, 1898.
646,680-646,6394. Telephone Exchange System. Edward E. Clement, Washington, D. C., and William D. Gharky, Philadphia, Pa., assignors to the Sun Electric Manufacturing Company of New Jersey. Filed Dec. 24, 1898, Aug. 20, 1898.

turing Company of New Jersey. Filed Dec. 24, 1898, Aug. 20, 1898.

646,689. Telephone System. William D. Gharky. Philadelphia. Pa., assignor to the Sun Electric Manufacturing Company of New Jersey. Filed July 1, 1897.

646,689. Intercommunicating-Telephone System and Apparatus. William D. Gharky. Philadelphia. Pa., assignor to the Sun Electric Manufacturing Company of New Jersey. Filed April 1, 1898.

646,699. Circuit Protective Device. William D. Gharky. Philadelphia. Pa., assignor to the Sun Electric Manufacturing Company of New Jersey. Filed June 16, 1898.

646,692-646,696-646,697. Telephone-Exchange System. William D. Gharky. Philadelphia. Pa., assignor to the Sun Electric Manufacturing Company of New Jersey. Filed June 16, 1898. April 21, 1899. May 7,1899.

646,693. Annunciator and Spring-Jack. William D. Gharky. Philadelphia. Pa., assignor to the Sun Electric Manufacturing Company of New Jersey. Filed June 16, 1898.

646,701. Plug-Seat for Telephone-Switchboards. Albert K. Keller, Philadelphia, Pa. Filed May 17, 1899.

MISCELLANEOUS.

Keller, Philadelphia, Pa. Filed May 17, 1899,

MISCELLANEOUS,
City, assignor to Harleston Corbett Gesner, New York
City, assignor to Harleston Corbett Gesner, same place.
Filed Dec. 18, 1899.
646,588. Device for Shifting Electric Current from one Conductor to Another. William D. Gharky, Philadelphia, Pa.
Filed July 2, 1895.
646,714. Railway-Signal. Herbert B. Taylor, Newark, N. J.
Filed Nov. 22, 1899.
646,715. 646,718. 646,719. Railway-Signal. James Wayland and
Herbert B. Taylor, Newark, N. J. Filed Aug. 5, 1899.
646,716. Electrical Indicator for Elevators. William H.
Baker, Central Falls, R. I., and Frederic E. Kip, Montclair, N. J. Filed Feb. 2, 1899.
646,742. Electric Bond for Street-Mains. Adolphus A.
Knudson Rutherford, N. J. Filed Dec. 15, 1899.
646,743. Medical Galvanic Battery. Harry Bentz, New York
City, Filed Nov. 9, 1899.
646,884. Storage-Cell. Henry J. Cogswell, Hartford, Conn.,
assignor to the Hartford Accumulator Company, same
place. Filed Peb. 5, 1900.
646,922. Storage Battery Elmer A. Sperry, Cleveland, O.,
assignor to the Cleveland Machine Screw Company,
same place. Filed Aug. 19, 1898.
646,923. Cellulose Envelope for Elements of Storage Batteries. Elmer A. Sperry, Cleveland, O. Filed Oct. 7, 1899.



### GENERAL NEWS.

#### What is Going On in the Electrical World.

#### LIGHTING.

Atlanta, Ga.—E. Woodruff, president of the Atlanta Railway & Power Company is preparing to erect an electric light and power plant.

Anburn, N. Y.—The Auburn Electric Light Com-pany contemplates making xtensive improvements to its electric lighting plant. J. Moore is president.

Broadalbin, N. Y -B ds will be received until April 15 for the erection of an electric light plant, to cost about \$10,000. Address J W Cleveland.

Brownville, Me.—The question of erecting an electric light plant is being discussed here.

Cato, N Y.—A movement is on foot to have this village lighted by electricity.

Clinton, Conn.—This town and Guilford are to have

Crystal Springs, Miss.—Bids will be received until April 16 for the material and construction of an electric light plant. Address C. A. Bedding, clerk.

Eddyville, Ia.—There is some talk in official circles about an electric light plant for this place.

Ephraim, Utah.—The city council has directed a pecial committee to secure a site for an electric light

Evergreen, Ala.—This city has decided to issue \$25,000 in bonds for the purpose of erecting an electric light plant and waterworks.

Fairfield, Conn.-The Uncowa Water & Lighting Company has been granted permission to erect an electric light plant and waterworks. S. C. Sherwood is president.

Guthrie, Okla.—Quigley & Co. of Sedalia, Mo., have applied for a franchise for an electric light plant.

Highland, Ill.—The question of bonding this town will be submitted to a vote of the people at the spring election, for the building of an electric lighting plant.

La Grange, Ga.—The city council has decided to purchase new machinery for the electric light plant, making the capacity 1,500 incandescent lights.

Lakeview, Ore.—The town council has purchased the electric light plant of J. Anthony at a cost of \$2.600 and will add to it about \$7,400 or more in the way of additions and improvements.

Marshfield, Ore.—This city will vote on the question of building a municipal electric light plant.

Minneapolis. Minn.—The Pillsbury Washburn Company has decided to install an electric light plant for lighting all its mills.

Natchitoches. La.—This city will hold an election on April 27, to decide upon the issuance of \$20,000 of bonds for the construction of waterworks and an electric light plant. J. C. Trichel, secretary.

New Iberia, La.—This city has voted the issuance of \$112,000 of improvement bonds for the erection of an electric light plant and construction of waterworks. Address Weeks & Weeks.

Omro. Wis.—A. P. Hoyt of Joplin, Mo., has been here looking over the field with a view of putting in an electric light plant.

Parker, S. D.—The citisens of this place are agitating the question of securing an electric light plant.

Red Wing, Minn.—F. W. Steeg of St. Paul has pre-pared estimates for a municipal electric light plant.

Ruston, La.—Arrangements are being made to establish an electric light plant here.

Santa Clara. Cal.—It is stated that \$39,000 in bonds have been sold for the purpose of erecting an electric

Springfield, Kv.—The citizens of this place are agitating the question of erecting an electric light plant.

Wallingford, Conn.—The council is to put \$15,000 more into the enlargement of the electric light plant owned and operated by the village.

Warren, O.—Mr. Buckman of Youngstown, backed

by a company, expects to put in an electric light plant at this place.

Yreka, Cal.—The citizens of this place are discussing the question of erecting a municipal electric lighting

### STREET RAILWAYS.

Annapolis, Md -The Beltimore County & City Railway Company, recently incorporated with \$59,000 capital stock, will build an electric railway. R. F. Choate, J. S. Waters and J. S. Russell are interested.

Bakersfield, Cal.—The Bakersfield & Kern Electric Railway Company has been incorporated for \$250,000 to construct and maintain an electric railway in Kern County C. R. Eager, S. V. Cushing, H. A. Bicdget and F. V. T. Whoiff are interested.

Catonsville, Md —The promoters of the proposed electric line north of here, which will connect with the Edmondson avenue line and run to Alberton, Howard County, have saked the property owners along the line to subscribe \$25 000 toward the building of the read.

Denver, Col -It is reported that another party of local capitalists is discussing the project of building an

electric line similar to the one proposed by the pro-moters of the Denver, Boulder and Northern project.

ELECTRICITY.

Goodrich, Mich—The people of this village are in favor of the Detroit, Lake Orion & Flint Electric Road, and in order to so ure it are willing to give the promoters a bonus of \$1,000 a mile, and a private right of way across Atlas township.

Kansas City, Kan.—F. Ogg, J. L. Pettijohn and J. E. Tryon have petitioned the board of county commissioners in this city, for a franchise to construct a double track electric interurban railroad between R sedale, and the western line of Wyandotte County.

Ligonier, Ind.-Sol. Mier, the Ligonier banker, bas received the grant of a franchise for an electric railway line from Lagrange to Warraw through three counties. It is proposed to build the road to connect with the Goshen and Orland, and the Legansport and Kendaliville lines.

Louisville. Ky.—The Louisville Railway Company will change its Bardstown branch to an electric line. D. J. Minary is president of the company.

Marshall, Mich.—The city council has granted a franchise for an electric railroad through this city to the Kalamazoo River Valley Electric Company. The company proposes to build an electric railway from Battle Creek to Jackson.

New Castle, Ky.—Parties from out of the State have been investigating into the project of building an electric railroad from here to Eminence. The prospects for the road are claimed to be good.

Piedmont, W Va.—An electric railway is to be constructed from Keyser to this place, a distance of five miles

Richmond, Ind.—The Wayne County commissioners have granted a franchise to J. J. Freeman and J. M. Lon'z, of this city, to build an electric line from Bichmond to the Henry County line, 20 miles west. It is claimed that the J. Pierpont Morgan syndicate is behind the project.

San Mateo, Cal.—The San Francisco & San Mateo Electric Railway Con pany has received a franchise from the city trustees.

Stewartstown, Pa.-Messrs. M Kay & Griffith, of Baltimore, who are interested in the construction of the electric light plant at this place, have made a proposition to the railroad efficials to convert the road into an electric line. The cost of the change is estimated at from \$15,000 to \$20,000.

Taunton, Mass —Articles of association have been published for the construction of an electric railway from here to Fairhaven, an opposition line to the one now established via Middleboro.

West Chester, Pa —The right of way for the proposed West Chester, Kennett & Wilmington Electric Railway Company is being secured.

Wheeling, W. Va.—The Wheeling & Wellsburg Street Bailway Company has applied for a franchise for an electric road from Bethany to West Liberty, Greggs-ville, Altenheim, and the National road to this city.

Worcester, Mass.—A new company to be known as the Worcester, Rochdale & Charlton Street Railway Company will construct an electric railway from Charlton to this city a distance of about ten miles.

Ypsilanti, Mich — Capitalists of this city are considering a proposition to construct an electric railway between Windsor and Leamington. If satisfactory arrangements can be made with the authorities of Essex County, it is probable that the premoters of the scheme will apply for a charter at the next session of the Legislature. islature.

#### COMPANY MATTERS.

Alexandria, Ind.—The Union Traction Company of Indiana is erecting a large building here to cost \$30,000, for a sub-power station to be used for the storage of two batteries for their lines between here and Elwood and

-The Chattanooga Electric Street Chattanooga, Tenn. Chattanooga, Tenn.—The Chattanooga Electric Street Railway Company will purchase at once sixteen new open cars and ten new closed ones, which will make a total expenditure of about \$90,000 for cars alone. Other improvements on the local lines are also contemplated and the company intends to expend a large amount of money in the very near future improving its system and saving. and service.

Colorado Springs, Col.—The Colorado Springs Light & Power Company is contemplating the enlargement of its plant and more than \$50,000 will be put in improvements at once.

Malvern, Pa.-An electric light, heat and power company has been organized here.

company has been organized here.

New York —The United Gas Improvement Company of Philadelphia and this city, which recently absorbed the Bridgeport Traction Company, will take over the property of the Derby Street Railway Company, capitalized at \$150,000, within a week. The syndicate will apply to the Legislature at its next session for a franchise to extend the road to Seymour, four miles up the Naugatuck R ver.

Niagara Falls, N. Y—A recent fire destroyed the plant of the Electrical Lead Reduction Company located here. The loss is estimated at \$25 000 President Salome announces that the plant will be rebuilt and increased to ten times its former size.

Pittsfield, Mass.—The Stanley Electric Manufactur-ng Company is to remain in this city.

Richmond, Va.—The Richmond Railway & Electric Company, foot of 7th street, will make extensive improvements to its plant. E. W. Trafford is superintendent

Sault Ste. Marie, Mich.—The Edison Electric Com-pany of this place has had plans prepared for a 40,000-horse-power electrical equipme t.

Waterville, Me.—The Waterville & Fairfield Railway & Light Company will spend about \$20,000 for installing new lighting machinery. W. S. Wyman, manager.

#### MANUFACTURING.

Elwood, Ind.—The Lee Electrical Manufacturing Company has been incorporated here, with \$50,000 capital. It absorbs the Robinson Hester Company, capital. It absorbs the Robinson means, and will manufacture electric lights and heating ap

Littleton, N C — E Johnston, secretary of the Mon-tank Water & Electric Power Company of this city, wants to correspond with manufacturers of electric plants.

Louisville, Ky .- The Kentucky Electrical Company manufacturers of motors and power creased its capital stock to \$50,000. n machinery, kas in-

Marlin, Tex.—C. C. Chatham, of this place wants rices on dynamos, boilers and engines, elevators, refrigerating machinery, etc.

Newark, N. J.—A company recently incorporated in which Edmund Dickey. H. F. Billmeyer and W. H. Gardner are interested is known as the Consumers' Carbon Company and will manufacture electric light carbons on a capital stock of \$500,000.

New York.—The Russell Electric Mallet Company, formed some time ago in New Market. Md., has removed its plant to this city where the company will manufacture dentists' mallets to be operated by electricity.

Philadelphia, Pa.—The Wirt Electric Company of this city incorporated last week in Dover, Del., will manufacture and deal in electrical instruments and machinery.

## POWER AND TRANSMISSION PLANTS.

Chibushus, Mex.—The authorities of this State bave granted the necessary permit to a syndicate of American capitalists, headed by R. M. Burke, of Chicago, to establish a mammoth electric power plant on the San Juan R ver, 87 miles southwest of this city, sund 47 miles from Parral, the two principal cities in the State. The power will be conducted to these cities and used for running industrial plants. The syndicate binds itself to expend not less than \$1,000,000 in the enterprise.

E'laworth, Me —The E'laworth E'ectric Light & Water Company contemplates adding an electric power generating plant to its station.

generating plant to its station.

Kingston, N Y—There is a rumor affect that New York parties, backed by well known moneyed men. are making arrangements to utilize Kasterskill Lake, with which to secure and furnish electric lights and power to the villages in its vicinity. Pipes are to be run from the lake to Haines Falls, where a power house will be located. From there wires will be strung to Palenville, Tannersville and Hunter for the transmission of the electrical nower. electrical power.

Tallsdega, Ala.—The question of transmitting power for electric plants is being discussed here and at Mountain H me. The power from the waste waters of Tallsdega. Choccolocco and the Coosa Valley would be more economical than can possibly be derived from the use of steam, and the cost reduced to a minimum.

#### AUTOMOBILES.

Cheshire. Conn—Walter Scott, proprietor of the Waverlev Inn of this place, is talking of establishing an automobile busline to run between New Haven, Cheshire and Southington. Mr. Scott wants to purchase two vehicles calculated to seat from 18 to 20 passer gers, and claims that there will be no trouble in securing the needed funds.

Hartford, Conn—A new delivery wagon has been added to Brown, Thomson & Co.'s delivery facilities. It is a handsome automobile built by the Columbia & Electric Vehicle Company and is the first of its kind to be put in use in this city.

New York.—Automobile coaches for the Fifth avenue stage line made trial trips last week between Washington Square and 86th street. They were operated successfully.

#### MINES.

Georgetown, Col.—The prospect of a large power plant here to supply electrical power to the mines in the vicinity is approaching realization. Frederick Dowey of the Bank of Clear Creek is the central figure in the United Light & Power Company, which, it is reported, will proceed at once to put up a plant at an outlay of \$100,000 or more.

outlay of \$100,000 or more.

Ophir, Col.—The Butterfiv-Terrible group on the West Stope of Yellow Mountain. Iron Springs mining district, San Miguel County, about one mile from this place, was recently purchased by a corporation for \$200,000. An electric plant is to be installed, and an effort is to be made to introduce electric drills, when the proper drill is found. Another improvement contemplated is the installation of cyanide tanks for the treatment of the tailings from the concentrating tables, whereby a much closer saving of the value will be effected. will be effected.



# THE TELEPHONE WORLD.

The La Crosse Telephone Company.

The La Crosse Telephone Company is primarily a corpora-

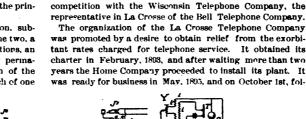
tion of the people and for the people of La Crosse, Wis. It

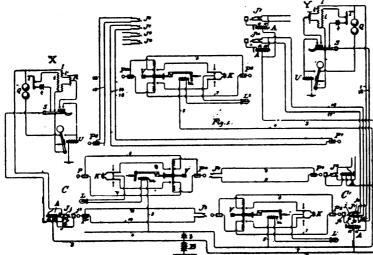
was among the very first to enter the independent field in

#### A Telephone-Exchange System

The accompanying illustration shows a telephone exchange system, patented last week by Edward E. Clement of Washington, D. C. No less than nine patents were issued on April 8 to the inventor covering the details of the system, the principal claim of which reads as follows:

"In a telephone exchange system, a central station, subscribers' stations and line-circuits interconnecting the two, a switchboard at the central station divided into sections, an answering and connecting jack and an annunciator permanently connected to each line circuit at one section of the switchboard, an answering jack and a signal for each of one





or more lines located at another section of the switchboard, circuit connections from the answering-jack to the answering and connecting jack, and means at the latter jack to continue such circuit connections to the subscriber's line, whereby the subscriber may either call or be called ordinarily upon one section of the switchboard but upon occasion may have his line prolonged for the purpose of answering his calls to another section of the switchboard, substantially as described."

The Southern New England Telephone Company has won its first case under the new general telephone law of Connecticut, which compels projectors of independent telephone companies to ask the Superior Court of the State to pass upon the question of public necessity and convenience. In the case under trial promoters of an independent company in New London, Conn., made the appeal a few months ago and the matter was tried at great length, a large amount of expert testimony being introduced on both sides. Judge Thayer of the Superior Court of New London County recently handed down a decision finding for the Southern New England Company and dismissing the case. The decision is final except as to questions of law, and is of extreme importance as a precedent in that State, where a number of independent telephone enterprises have been swaiting the finding of the court

The annual meeting of the stockholders of the Frederick County Telephone & Telegraph Company was held in Frederick, Md., recently, when the following board of directors was elected: James E Walker, Dr. P. D Fahrney, Col. D. C. Winebrenner, Edwin Devilbiss, Dr. Franklin B. Smith, William P. Maulsby, Jr., and Daniel T, Ordeman. The board organized by electing James E. Walker, president; Daniel T. Ordeman, secretary, and Dr. Franklin B. Smith, treasurer. This month the company will enlarge its plant by extending its lines in various sections of the county now without telephonic connection, and by installing a new 500-connection switchboard for metallic circuits, which will be supplied the subscriber to replace the grounded ones. Work on the line from Frederick to Thurmont has already been begun.

The contest for the independent telephone franchise in Wheeling, W. Va., is said to have suddenly been livened up by the vigorous action taken by the Home Construction & Telephone Company. In addition to offering a cash bonus, accompanied by a certified check, the company has placed itself in an advantageous situation by corcluding agreements with the Central West Virginia Telephone Association and the Ohio Telephone Association, assuring its connection with all independent companies in West Virginia and Ohio.

In the case of Davis against the Pacific Telephone & Telegraph Company the Supreme Court of California has recently decided that penal statutes forbidding injury to or removal of telegraph wires and poles are applicable also to telephone wires and poles. lowing, operated an exchange with more than 400 subscribers. The La Crosee Telephone Company is daily increasing its number of patrona, and enlarging its business, so that to-day it has nearly 800 connections, including the city offices, fire stations, schools, county building and offices and police department. Its service is of the very best, and a vast improvement over conditions existing when it went into business. Every new device for the improvement of its service is adopted, and the officers and manager are alert to give its patrons the very best service possible.

Its rates have not varied from the day it opened its plant to the public, and they have been uniformly maintained at \$2.50 % month for business and \$1.50 a month for residence telephones. When the rates formerly exacted by the old company of \$4 to \$6 for business and \$3 a month for residence telephones are considered, it is easy to compute what the advent of the La Crosse Telephone Company has meaut, and what it will continue to mean to the telephone subscribers of La Crosse; during the five years since the Home Company installed its plant, more than \$46,000 have been saved to the telephone users of that city.

The New England Telephone & Telegraph Company has filed the following certificate of condition with the Massachusetts Secretary of State: Assets Real estate, \$20,119; cash and debts receivable, \$1,585,162; merchandise, material and stock, \$586,649; plant and franchise, \$16,969,710; miscellaneous, \$820,667; total. \$19,992,307. Liabilities—Capital stock, \$13,759,100; debts, \$4,387,866; reserve, \$754,755; balance, profit and loss, \$1,090,586; total, \$19,992,307.

Durham, Greensboro and Winston, N. C., are now connected by telephone, the first call being made a few days ago! The line is owned by the Inter-State Telephone Company. Charlotte and Winston are not yet connected, but it is reasonable to expect a line between the two cities within a month or two. Soon Charlotte will be able to talk to people all over the State of North Carolina.

The Cumberland Telephone & Telegraph Company has authorized the manager of the exchange at Jackson, Tenn., to make reductions in telephone tolls for nearby stations, as follows: One to seven miles, 10 cents; seven to fifteen miles, 15 cents; fifteen to twenty miles, 20 cents.

The Delaware & Atlantic Telephone Company has asked permission of the council of Ambler, Pa., to entend its lines through that borough.

The capital stock of the Ava & Southern Illinois Telephone Company of Ava, Ill., has been increased from \$2,500 to \$5.000.

The Hotel Cadillac of Detroit, Mich., has made a contract with the Michigan Telephone Company for 200 long distance telephones.

#### Good Service Hurt the Bell.

A dispatch from Staunton, Va., to the N. Y. "Commercial says: "The telephone conditions which prevail here are decidedly interesting. Some years ago the Bell Company began operations here and established an exchange with about 200 subscribers, the annual tariff being fixed at \$50.

"This rate was considered too high, and some time later the Mutual Independent Company was started, with rates at \$10 a year. This caused the Bell Company to reduce its tariff first to \$40 and lately to \$6 a year. "Meanwhile the Mutual Company extended its lines

"Meanwhile the Mutual Company extended its lines throughout this and five other counties, with a subscribers' list of 500. The charge was raised to \$15, but the service is of a superior character, for a merchant can sit in his office and converse with people in every post office and store in Augusta, Rockingham and Rockbridge counties, without extra charge, and with many places in Nelson, Alleghany and Highland counties. Probably one-quarter of the business of this locality is done by telephone.

"The Bell lines do not extend out of town. This company has made unsucce-sful efforts to secure legislation to injure its successful independent rival."

The Southern Bell Telephons & Telegraph Company, which has a monopoly of the telephone business in Birmingham, Ala., and its prominent suburbs—Ensley, Pratt City, Woodlawn, Besserrer and Woodward—is fighting a franchise for a home company to 8. B. Claypool and associates, who have petitioned the city council to grant a charter for the installation of a new system. The new company makes a proposition that a rate one-half of that charged by the Southern Bell Company will be charged. The present company gives a good service, having all its wires in the heart of the city underground, but the prices are quite high, 'phones in residences being \$36 per annum, and business 'phones \$48.

C. N. Haskell, of Ottawa, O., president of the Lone Star Telegraph & Telephone Company, with a capital stock of \$500,000, which recently filed a charter in Austin, Tex., has been some time in that State directing the preliminary arrangements for the construction of toll lines, and the establishment of local telephone exchanges in all the principal cities. He states that the company proposes to expend not less than \$1,000,000 in Texas, and that the proposed system will be a strong competitor with that of the Southwestern Telegraph & Telephone Company.

A dispatch from Connellsville, Pa., to a Pittsburg paper states that the directors of the Connellsville, Klondike & Normalsville Telephone Company held a unique meeting recently. The directors live many miles apart, separated by mountain ridges. Each, however, has a telephone. All got together on the line, increased the capital stock from \$3,000 to \$5,000 and transacted other business Motions were made and seconded, resolutious offered and adopted over the wire.

The Southern New England Telephone Company has gained control of the telephone service in Norfolk, Conn., which system has heretofore been operated by the Norfolk Electric Light Company. The price paid is said to be \$17,700.

Efforts are being made in Pittsfield, Mass., to organize a local independent telephone company. The promoter of the scheme is Mr. William G. Simpson, formerly connected with the General Electric Company.

The Minneapolis council by a vote of 25 to 1, has repealed the ordinance granting a license to the Northwestern Telephone Exchange Company to operate in that city.

The Automatic Telephone Company has applied for a franchise in Holyoke, Mass.

## TELEPHONE INCORPORATIONS.

The Valley Telephone Company, Emlenton, Venango County, Pa. Capital stock, \$5,000.

The Ida County Telephone Company, Ida Grove, Ia. Capital stock, \$10,000. Incorporators: J. E. Conn, F. Brasted, both of Ida Grove.

The Apalachicola & Tallahassee Telegraph Company, Tallahassee, Fla.—to operate telegraph and telephone lines, Capital stock, \$10,000.

The Greenspring Telephone Company, Greenspring, O. Capital stock, \$8,000. Incorporators: J. C. Kanney, E. L. Johnson, P. T. Perin, R. D. Reynolds, H. W. Robinson and C. L. Smith.

The Citizens' Telephone Company, Kokomo, Ind. Capital stock, \$25,000. Incorporators: W. H. Turner, of Kokomo; C. E. Hardyke, H. B. Laly, C. S. Norton, all of Indianapolis.



## LECTRICA SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electricity from a variety of sources.

The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it

\*\*Show to have brought to their attention and preparation, and every entert is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

\*\*Abbreviations: crt. indb., certificate of indebtedness: coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., construction; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mkg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

## STOCKS.

PASSE	N	SER R	AILW	AYS.	<del></del>		PASSENGER RAILWAYS.							
FAME.	Par	Capital Authorz'd		Bate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Capital		Bate and Date of Last Div.	Bid.	Anke	
Albany, N Y ≺ 9 United Traction	100	\$-1,000,000	5 COO OCO	1½ % Q., Nov. '98	. 123	124	Hartford ConnApr 9: Hartford Street Ry. Co	100	\$4,000,000 1,000,000		3 % B., Oct., '98.	150	=	
Troy City Bailway.)							Holyoke Mass.—Apr 9.  Holyoke Street By. Co	106	400,000	400,000	8 % A., Jane, '98.	2073	212	
Allentown Pa.—Apr 9 Allentown & Lebigh Val. Trac Co		4 000 000	1,500,000	• • • • • • • • • • • • • • • • • • • •		15	Hoboken, N. J.—Apr 9 North Hudson Oo. (N. J.) Ry. Oo	. 25	1,250,000	1 000 000	8 %, 1892.	150		
Bridgeport, Conn-Apr 9: Bridgeport Traction Co	100	2,000,000		1 % Aug., '98	105		Indianapolis, Ind-Apr 9. **Indianapolis Street Ry					24	28	
Baltimore *Md.—Apr 9 United Rail ways & Elec. Cocom	. 54	24,000,000	18,000,000		161/4	1634	Lancaster, Pa.—Apr 9 Pennsylvania Traction Co Lancaster & Col. Electric By		10,000,000	9,900,000 87,500		::	-	
BOSTON, MASS.— Apr 9 New England Street By	10 10 5	0 4,000,000 0 2,000,000	4,000,000 2,000,000 9,085,000 6,400,000	1 % Q., Jan.15, '97 6 % S., A. & O. 3% % S., Oct., '98. 4 % S., Jan. 2, '99. 2¼ % Aug. 98,	15 85	16 87 13 114 1.0	West End Street Reliway	100	4,000,000	•••••	11/4 %., April '98. 21/4 % S., Oct. 1, '98	-	111	
Brooklyn N. Y Apr 9. Brooklyn City Ry Brooklyn Rap. Transit Co., tr cerif.  aBrooklyn Heights Railroad  dBrooklyn City RRgua  Brooklyn, Queens Co. & Sub. RR	10	. 2,000,000	43,000,000 200,000 12,000,000 2,000,000	3½ % Q., Jan., '99	285 79 107 107 2.7	236 793 8 109 289	Twin City Rapid Transitcom Twin City Bapid Transit7% ptd Montreal, Canada.—Apr 9. Montreal Street Ry. Co	50	4,000,000	1,712,200 4,000,000	13/4 %, Oct., '98. 18/4 %, Oct., '98. 18/4 %, S., M. & N.	259 x	189	
Coney Island & Brooklyn RR Kings County Elevated Kings County Traction Co Nassau Electric Baliroad	10	4,750,000 4,500,000 6,000,000 2,000,000	4,750,000 4,500,000 6,000,000 2,000,000	1 % July 26, '97	75	£0 ::	Memphis Street Railway Co  New Haven, Conn.—Apr 9: Fair Haven & Westville RR New Haven & Gonterville	25	2,000,000 1,250,006	2,000,000	8 % S., Sept. '98.  2 % % A., July '96.	25 89 	4	
Buffalo N. Y.—Apr 9 : Buffalo & Niagara Falis Elec. Ry *Buffalo Railway Co Columbus O.—Apr 9	10 10			1 % Q. Dec., '98.	74 100	75 103	Winchester Avenue RR	. 25	1,000,000 240.000	240,000	4 % S., July, '98.	1485	15:	
Columbus Street Railroad	. 10 50	0 1,500,000	1,500,000	1 % Q., Feb., '99.	24 × 84 ×		New Orleans Traction Co new com New Orleans Traction Co new pfd aCrescent City RRguar bNew Or. City & Lake RRguar Orleans Rajiroad.	100 100 100 100	2,000,000 2,000,000	••••••	3 % S., Jan., '99. 3 % S., Jan., '99. 1 % S., June, '94. 1 1/2 %. Oct., '98.	25 101 203	10 2	
Enterprise City RR. Co.  Chicago, Ill. – Apr 9 Chicago City Ry. Co. Chicago & South Side R. T. RR. Lake Street Elevated RR. Metropolitan West Side Elev. Ry. Met. West Side El., pid. North Chicago Street RR. Abnorth Chicago City RR. Bouth Chicago City Rallway West Chicago St. RR. Co. (Chicago West Div. Ry. guan t Chicago Passenger Ry. guan	10 10 10 10 10 10	0 12,000,000 0 10,823,800 0 10,000,000 0 15,000,000 0 15,000,000 0 10,000,000 0 2,000,000	12,000,000 10,325,800 10,000,000 7,600,000 9,000,000 6,500,000 249,900 11,608,200 18,189,000	Feb 28 1900.  8 % Q., Jan., 99.  11% % Q., Feb. 99.	9 27 717 285	273 916 23 78 237 	New Yopk—Apr 9. Central Crosstown RE. cChristopher & 10th Sts. RRguar Dry Dock, E. Brdw'y & Battery RR dMetropolitan Street Ry. Co «Bleecker St. & Fulton Fy. Ry. gua fBroadway & Seventh Aveguar gCen. Park, N.&E. Rivers RR. gua AEighth Avenue RR	100 100 100 100 100 100 100 100 100 100	600,000 650,000 1,200,000 45,000,000 2,100,000 1,800,000 1,000,000 750,000 800,000	600,000 650,000 1,200,000 45,000,000 900,000 2,100,000 1,800,000 748,000 800,000	2½ % Q. 2½ % Q., Oct., '98. 1½ % Q., Nov., 98. 1½ % Q., Feb., 1500 12½ % A., July, '98. 12½ % Q. 12½ % Q.	270 176 100 107 83 230 195 495 198 198 400	30: 18: 12: 16: 3: 24: 40: 41: 20: 4:	
Cincinnati, Ohio.—Apr 9: Oincinnati Inc. Plane Bycom Oincinnati Inc. Plane Rypic Oincinnati, Newport & Cov. St. Ry Oincinnati Street By. Co Mt. Adams & Eden Park Inc. Ry	1. 5 5 10 5 5	0 1,000,000 0 150,000 0 4,000,000 0 18,000,000 0 2,500,000	575,000 150,000 8,500,000 14,000 000 2,200,000	) % % Feb., '99. 2% % Feb., '98. 114 % Q., Jan., '98.	84 1243	89 12,	Second Avenue RR. Third Avenue RR.  m42d St., Manhatv'le & St. Nich. Av *Union (Huckleberry) Ry.  Newark N. J.—Apr 9 Consolidated Traction Co. of N. J.  North Jersey Street Rallway Co	100 100 100 100	2,500,000 12,000,000 2,500,000 2,000,000	2,500,000		199 1(77/ t0 190 60 80%	100 100 200 61	
Cleveland, Ohio Apr 9 Akron, Bed. & Clev. Elec. By Develand City By Develand Electric By	. 10	0 8,000,000	7,600,000	34 % Jan., '98 8-5 % Jan. '99, 14 % Q., Oct., '98	48 102 87	50 108 81	United Electric Co. of New Jersey Pittsburg, Pa.—Apr 9. Allegheny traction Cocom oCousolidated Traction Cocom	50	504,000	504,000	11% % A.	28 55 27	5	
Detroit, Mich.—Apr 9 Detroit Citisens' Street By Pt. Wayne & Belle Isle By Bejrid Bailway Co Detroit Electric Railway Wyandotte & Detroit River Ry	10	250,000 1,000,000	1,200,000 250,000 1,000,000		100 } 175 90 	i00 i10	Consolidated Traction Copfd pCentral Traction Co qCitizens Traction Co rDuquesne Traction Co sPitisburg Traction Co Fed rai St. & Pleasant Valley Ry. Pgh. Allepheny & Man Trac Co.	50 50 50 50 50 50	1,500,000 1,500,000 8,000,000 8,000,000 2,500,000 1,400,000	15,000,000 1900,000 18,000,000 1,900,000 1,400,000	) 6 %, Nov. '98. ) 1 ½ % Nov. 7, '98. ) 6 % A. ) 6 % A. ) 3 ½ %, Nov. 7, '98. ) 2 ½ %, July, '98.	65 69 × 10	7	
Dayton O.—Awr 9 Dity Railway Co	10	0 600,000	1,470,600 600,000	1½ % Q. 1½ % Q.	140 170 114	145 115	P tissourg & Birmingham Trac. Ry. Pitisburg & West End Ry. United Traction Cocom United Traction Copref	25 50 50	8,000,000 8,000,000 1,500,000	1,500,000 1,500,000 17,000 000	9 2 %, Aug., '95. 0 1 %, Oct. '98 0 5 % A., June 80, 9 J. & J.	41 12 503	11 5	

\*Unlisted. † Ex div.
a The United Railway & Electric Company comprises in its organization the Baltimore Consolidated Railway & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co of Baltimore. The pref stock of U R & E ec. Co. has been issued in the form of moome bonds. b Leased to Boston E'evated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Boston E'evated Railroad Co., which guarantees 10% on capital stock.
Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Heights Railroad Company; road operated by Brooklyn Heights Railroad Company; road operated by Brooklyn Rapid Transit Company; road leased to Nassau Electric RR.
g Owned by Atlantic Ave RR and leased to Nassau system.
\$30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.;
Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and
West Chicago Street Railroad Tunnel Company.

\$50 per annum paid on outstanding capital as rental by lessee—North Chicago Street
Bailroad Company; \$625.00 of stock owned by West Chicago Bireet Railroad Company; \$5 per annum paid on Ophicago Street Railroad Company; \$600,000 stock guaranted by West Chicago Street Railway Company; \$600,000 stock guaranted by West Chicago Street Railway Company; \$600,000 stock guaranted by West Chicago Street Railway Company; \$600,000 stock guaranted by West Chicago Street Railway Company; \$600,000 stock guaranted by West Chicago Street Railway Company; \$600,000 stock guaranted by West Chicago Street Railway Company; \$600,000 stock guaranted by West Chicago Street Railway Company; \$600,000 stock guaranted by West Chicago Street Railway Company; \$600,000 stock guaranted by West Chicago Street Railway Company; \$600,000 stock guaranted by West Chicago Street Railway Company; \$600,000 stock guaranted by West Chicago Street Rai

• Unlisted. † Full paid. | Outstanding. † Ex-div.
a Leased to New Orleans Traction Company at 6 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
c Leased to Central Orosstown Railroad at 8 % on stock and interest in bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
c Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway
g Leased to Metropolitan Street Ry. for 99 years from Lan. 1, 1895; thereafter 9 %.
h Leased to Metropolitan Street Ry. for 99 years from Lan. 1, 1895, at \$215,000 per annum.
i Leased to Metropolitan Street Railway for 18 % on stock
i Leased to Metropolitan Street Railway for 18 % on capital stock.

Controlled by \$\frac{1}{2}\times d\times \text{Ayenue Railroad by purchase.}
n Dividends of \$\frac{1}{2}\times \text{Vessed to Consolidated Traction Company,}
o Controls by lease the Alleg'ny, Cent., Citiz—ns' Duquesne, Fort Pitt & Pits'h Traction.
p Leased to Consolidated Traction Company for 8 % ner annum on par value of stock,
r Leased to Consolidated Traction Company for 6 % on \$3,000,000 capital stock.

s Leased to Consolidated Traction Company for 6 % on capital stock.
s Leased to Consolidated Traction Company for 7 % on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

PASSENGER RAILWAYS.							TELEPHONE	AI	VD TE	LEGR	RAPH COS	•	
		Capital	Stock.	Bate and Date of					Capital	Stock.	Rate and Date of		
NAME.	P <b>a</b> i	Autrors d	Issued.	Last Div.	E3d.	Asked.	NAME.	Par	Authors'd	Issued.	Last Div.	BH.	Model
New Bedford Mass-Apr 9 Union Street Railway Co	100	\$850,000	\$850 000	2 %, Feb. 98.	160	165	Boston, Mass.—Apr 9. American Bell Telephone Co	100	50 000 000	28 650 000	42 % O Ton 200	915	917
Northampton, Mass-Apr 9		' '		7, POD. II.		1	Erie Telegraph & Telephone Co New England Telephone Co	100	10,894,600	10,804,600	4% % Q., Jan., '99. 1 % Q., Feb. 20, '99 \$1.50 p. sh. Feb '99.	1015/	105 140
Omaha, Neb Apr 9.	100	800,000	225,000	4 % A., June '98.	170	178	New York.—Apr 9.					_	
Omaha Street Ry	100	5,000,000	5,000,000	8 % A. and N.	55	65	American Telegraph & Cable Co  *Central & South Am. Teleg. Co  *Commercial Cable Co	100 100 100	6,500,000 10,000,000	6,500,000 10,000,000		107 165	96 109 170
Paterson Ry. Co	100	1,250,000	1,250,000	********	54	-	Franklin Teleg. Co2½ % guar.   Erie Telegraph & Telephone Co	100 100	1,000,000 5,000,000	4,800,000	1; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;	42 112	50 1:8
Providence, R. I.—Apr 9: United Traction & Electric Co	100	8,000.000	8,000,000	34 %, Oct. '98,	109	111	#Gold & Stock Telg. Coguar. 6 %. #International Ocean Tel Co.guar 6% Mexican Telephone Co	100 100 100	5,000,000 8,000,000 2,000,000	*****	12 % &	118 116 25/2	128 118 23/4
PhiladelphiaApr 9		2 000 000	1 550 000	9 % Dec 198	28	24	*New York & New Jersey Tel. Co *Pacific & Atlantic Telegguar. 4 %	100 25	5,000,000	8,728,000	2 % % Q., Jan., '99. 2 % 8.	170	175 75
Fairmount Park Trans. Co 50 pd. nestonville, Man. & Fairmount Hest'nvl'e, Man. & Fairm't 5 % pfd.	50 50	1,966,100 588,900	11,966,100 1588,900	2 %, Dec. '97. 2 %, July 15, '98. 8 % S—July, '98. 8 % Feb. 1, '98.	47 75	48 76	*Postal Telegraph Cable Co*Sout'n & Atlantic Telg. Co.guar.5 % †Commercial Union Telegraph Co	100 25 25	950,000 500,000	559,525 500,000	1 % Q. 2% % S. 8 % S., Jan., '99.	95 115	100 116
GFairmount Pk. & Had. Pass. Ry.		800,000 80,000,000	800,000 29,980,450	8 % Feb. I, '98.	75 355 a	76 397/	Western Union Telegraph Co †Div. guar. by Postal Teleg. Co.	•	••••	97,870,000	1% %, Q, Jan. '99.		883%
ditisens' Passenger Ry Frankford & Southwark Pas. R	50 50		11,875,000	814 sha'e A—Apr.98	845 45	451	Miscellaneous Apr 9:	25	400,000		1 <b>% Q</b> .	21	84
(Lehigh Avenue Ry. Co	50 25 50	1,060,000	1,000,000	A. & O. \$9 share A, Mar. 98	90 Ri O	90%	American Dist. Teleg. (Phila.) Bell Teleph. Co. (of Canada.) Chesapeake & Potomac Telep. Co	100 100	8,960,000	8,561,000		188 55	62
dSecond & Third Streets Ry People's Traction Co gGermantown Passenger Ry	50 50	10,000,000 1,500,000	16,000,000 1572,800	8 %, A., April, '98. \$5.25 share—1898.	144	145	Chicago Telephone Co	100 100	750,000	750,000	***	200 148 75	210 150 76
APople's Passenger Rycom.	50 25	500,000	1150,000	8 % Jan., 1898.	151	152	Hudson River Telephone Co *Northwestern Telegraph Coguar	100 50	2,000,000 2,500,000	2,000,000 2,500,000	1 X Q. 2% X Q.	120 124	125 125
APeople's Passenger Rypid. Philadelphia Traction Co Catherine & Bainbridge St	50 50	30,000,000	1400,000	\$2 p. sh., Oct. 98.	98	961/4	Providence (R. I.) Teleph. Co Southern New Eng. Teleph. Co	50 100	8,000,000		••••	94%	<u> </u>
*Continental Pass. Ryguar  *Empire Passenger Ry. Co	50 50 50	1,000,000 600,000 1,000,000	1580.000	\$6 share July, '98. \$7.50 share July '98.	202	157	ELEOTRIO LIGHT	IN	DEL	EOTR	OAL MFQ	. 0	<u>08.</u>
Philadelphia City Pass. Ry Philadelphia & Gray's Fy. RR Ridge Avenue Passenger Ry	50 50	1,000,000	298 650	OR Knahara July 195	100	۱	Boston, Mass.—Apr 9: Fort Wayne Electric trust receipte	••			•		125
Philadelphia & Darby Ry.guar.	50 50 50	1,000,000	200,000 250,000	\$12 share, July '98. \$2 share July, '98. 1½ % S., July, '98. \$11 sh. A., July, '58	800	::	Ft. Wayne Elec Co. T. Sec. Series A. †General Electric Co. [old]com. General Electric Co. [new] "	25 100	40,000,000	80,460,000	2 % Q., Aug., 1898. 1% % Q., Jan., 1900	85 1218.	50 182
Thirteenth & 15th Sts. Pass. Ry. Union Passenger Ry. Co	50 50	1,500,000 750,000	1900,000	89.50 shre, July '98 810 share, July '98	203	240	TH. Elec. CoT. Secur., Series D. Westinghouse Elec. & Mig.Co.com.	50	•••••	146,700	::::	2> 46	2¾ 17
Rochester, N. YApr 9						90)	Westinghouse El. & Mfg. Co. pfd. Westinghouse El. & Mfg. Co. assent.	50 50	4,000,000 11,000,000	8,996,058 8,195,126	1¼ % Q., Jan., '99.	61 42	<b>68</b>
Reading, PaApr 9		5,000,000	5,000,000	******	1934	20%	New York.—Apr 9: Edison Elec. Ill'g Co., New York	100	9,188,000	7,988,000		119	120
j seeding Traction Co	50	1,000,000 850,000	1,000,000 850,000 \$1,000,000	Semi-an.,Jan. & Jy Jan., '98.	186	26	Edison Elec. Ill'g Co., Brooklyn Edison Ore Milling Co Electric Vehicle Cocom.	100 100	4,000,000	2,000,000	1% % Oct., '88.	 8 82	12 93
East Reading Electric Ry St. Louis MoApr 9	50	1,000,000	<b>‡1,000,000</b>	Jan., '98.	70		General Electric Oo. [old]com.   General Electric Oo. [new] "	100 100	40,000,000 18,276,000	80,460,000 18,276,000	2 % Q., Aug., 1898. 1½ % Q.,Jan., 1900.	181	182
Fourth Street & Arsenal Ry	DU	800,000 400,000	150,000 400,000	2 % Dec., 1888.		::	Interior Conduit & Insulation Co   Kings Co. El. L. & P. Co	100 100	1,000,000	1,000,000 2,500,000		181 I	135
Lindell Ry		2.500.000	2,400,000 2,479,000 2,500,000	2 % Dec., 1888. 1¼ % Jan., '99. 1¼ % Jan. '99.	::	••	Pittsburg, Pa.—Apr 9 Lilegheny County Light Co	100	500,000	500,000		166	172
Oitisens' KK	100	2,000,000 2,000,000	1,500,000 2,000,000	4 %, Oct., '98. 2½ %, Jan., '99. 1½ % Jan., '99. 50c., Dec., '89.	::	::	Philadelphia, Pa.—Apr 9	50	800,000	800,000	9	-	••
Viscouri RR. Pe ple's RR. Co	50	2,400,000 1,000,000 500,000	2,800,000 800,000	1½ % Jan., '99. 50c., Dec., '89.	25	23	Edison Electric Light Co *Electric Storage Battery Cocom.	100 100	2,000,000 8,500,000	• • • • • • • • • • • • • • • • • • • •	•••••	144 88	144 <b>%</b> 93
United Electric Ry 7 prei.	100	1,000,000 2,500,000	2.500.000	8 %, Jan., '99.	ಕ\) 68	85 10	*Electric Storage Battery Copfd. Northern Elec. Light & Power Co Southern Elec. Light & Power Co	100 10-	5,000,000 550,000 187,500	550,000 187,500	•••••	90 18 90	95 18%
sion Depot RR	100	4,000,000	4,000,000	8 % A., July, '95.	••	•	MiscellaneousApr 9:		1	201,000			
C .lifornia St. Cable RR	100	1,000,000 1,000,000	875,000	50c. monthly. 82.50 share, '96.	117 50	119	Bridgeport (Conn.) Elec. Lt. Co Missouri-Edison (St. Louis)com. Eddy Electric Mfg. Co	25 25	500,000		••••	47 20 10	48 21 14
Market Street Ry Presidio & Ferries RR	100 100			Q., 60c. per share.	611/2	68¾ 16	Eddy Electric Mfg. Co	100 25	850,000 175,000		••••	150	151 10
Scranton Pa -Apr 9 Beranton Railway Co	50	6,000,000		*************	29	80	New Haven (Conn.) Elec. Lt. Co Narragansett (Prov., R.I.) Elec. Co. Rhode Island Elec. Protec. Co	100 50 100	1,200,000 1,200,000		2 % Q., Oct., '98.	195 98 1184	100
m Scranton & Carbondale Trac. Co m Scranton & Pittston Traction Co	100 100	500,000 1,050,000	500,000 1,050,000	*************	165		Toronto (Canada) Elec. Light Co	100	1,000,000 1,085,000	1,085,000	1	160	161 182½
Springfield III.—Apr 9: Springfield Consolidated By	100	750,000	750,000				Thomson-Houston Welding Co	100	the steel			106	106 106
Springfield OApr 9 Springfield Street By	100	1,000,000	1,000,000			11	to \$20,827,200, of which \$18,276,000 is c Recently acquired the Edison Illi	om n	on and \$2	.551,200 pr	eferred.	i Ex	div.
Springfield, MassApr 9.			, .			212	pany, the Municipal Electric Light	Co.					
pringfield Street By	100	1,200,000	1,166,700	-	207	212	Boston Mass.—Apr 9:	-	100	JIRIE	<u>.                                    </u>	1	
Toronto Street Ry Montreal Street Hailway Co	100	6,000,000 4,000,000	6,000,000 4,000,000		100 299	300	Delaware Gas Light Cocom. Delaware Gas Light Copref.	50 50	500,000	500,000 200,000	J. & J. J. & J.	72% 98	
Washington, D. CApr 9	50	500,000	500,000				American Electric Heating Co	50 100 100	10,000,000 <b>4,5</b> 00,000	1,248,700	2 p. sh. Jan. 26, '99 8.50 p.sh. Nov'98.	::	100
Belt Ry. Co	100 50 50	112,000,000 400,000	400.000	55c. per sn, Oct. W. 5 % Å.		107	New YorkApr 9:	100	•••••	1,000,000	96.90 P.BD. 106. 36.	-	LUI
Eckington & Soldiers' Home Ry Georgetown & Tenallytown Ry Metropolitan RR. Co	50 50	707,000 200,000 1,000,000	200,000 458,900	2% % Q.	35 15	16	Consolidated Electric Storage Co Safety Car Heating & Lighting Co	100	••••	•••••	****	8 150	12 156
Worcester, MassApr 9	100				901.	911/	Worthington Pump Cocom. Worthington Pump Copfd	100 100	5,500,000 2,000,000	5,500,000 2,000,000	7 % A	10 <b>0</b>	L <b>10</b>
*Worcester Traction Co6 % pfd. Worcester & Suburban Street Ry	1000	2,000,000	2,000,000 542,500	3 % S., Feb., '96. 4% %, 1897.	80 k	81½ 105 85	Philadelphia Pa.—Apr 9 Electro Pneumatic Trans. Co	10	1,500,000			234	81 <u>√</u> 162
Wilkesbarre, PaApr 9	100					29	United Gas Improvement Coscrip, Welsbach Commercial Cocom. Welsbach Commercial Copfd.	100 100	10,000,000 8,500,000 500,000	******	 8×9	91/2	163 5 % 55
Wilkesbarre & Wyoming Val. Trac  * Unlisted. † Paid in. ‡ Full	paid	.   Outst	anding.	Ex-div.	26		Welsbach Light Co	5	525,100 500,000				41 154
a Leased to Hestonville, Man &	t Fai	rmount Pa	assenger l	ty, for 6 % on stock			Pittsburg, Pa.—Apr 9: Carborundum Mfg. Co Standard Underground Cable Co	100	200,000	200,000		_	
Practically all shares owned	by U	Inion Trac	tion Com	Dany.			Standard Underground Cable Co Miscellaneous.—Apr 9:	100	1,000,000	1,000,000	Q	175	180
d Lease to Frankford & Southw Leased to Electric Traction C	omp	Passenger any.	r Ky. assu	med by Electric Tr	actio	n Co.	*Barney & Smith Car Cocom. *Barney & Smith Car Copfd.	100 100		1,000,000 2,500,000	1 × 1	14 164	17½ 106
g Leased to People's Passenger  h Majority of stock owned by l	· Rai Peop	lway at \$5 le's Tracti	per share.				Billings & Spencer Co	25 100	1,250,000	1,250,000	% % Feb. '98	82 55	58
Leased to Union Traction Con     ∫ Lease transferred to Union Tr	npar racti	iy. on Conipa	n <b>y</b> .	<b>210 000</b>	i den 1	1984_7 4	Johns-Pratt Co	100 100 100	•••••	••••••		105   4 47	109 8 52
p.a. \$20,000 in 1839-1900 and \$30 0 0	per	annum ti	iereaiter,	payabie semi-anni	ally,	rental	Stillwell-Bieros Copfd.		••••••		X Sept 1.'98.	1	50 65 90
b Dividend of 10 % guaranteed b Dividend of 6 % guaranteed b Leased and operated by the 8	by I	eading IT	erion coi	mpany.	- اغموم	nn Ch	Shults Belting Co	100	500,000	*******	****	80 <b>SO</b>	160 168
Tanken and obstrated by the a	-ve mil	-UM AMILW	vo., 10	. more commensure I		<del></del>	- y=	'	1	•		•	

# BONDS.

PASSENC	ER R	AILWA	Y.				PASSEN	GER I	KAILW	٩Y.			
	Amou	mt.		Interest				Ame	ount.		Interest		
NAME.	Authorized.	Issued.	Due	periods.	Bid.	Anked.	RAME.	Antihordsod	Issued.	Due	periods.	Bid.	Asto
Albany N. Y.  Date of Quotation—Apr 9, 1900 The Albany Ry. CoCons. mtg. 5s. The Albany Ry. CoGen. mtg. 5s. Watervleit Turnpike & RR. 1st mtg. 5s. Watervleit Turnpike & RR. 2d mtg. 6s. Troy Oity Railway Co	\$500,000 750,000 850,000 150,000	427,500 875,000 850,000 150,000		M. & N. M. & N. M. & N.	*117 *125	1271/ <sub>2</sub>	New Orleans La.  Date of Quotation—Apr 9, 1800 Canal & Claiborne RR cons. mig. 8s. Crescent City RR lat mig. 6s. Orescent City RR lat mig. 6s. New Orleans City RR lat mig. 6s. N. Orleans & Carrollton RR. 2d mig. g. 6s. N. Orleans & Carrollton RR. 2d mig. g. 6s. Orleans Railroad Co Cons. mig. 6s. 18t. Charles St. RR. Co lst. mig. 6s.	5.000,000 416,500 5,000,000	899,000 2,599,500 850,000 800,000	1899 1948 1908 1948 1907 1912	M. & N M. & N J. & J. J. & D. J. & J. F. & A. J. & J. J. & D.	105% 108 112	112 118
fInterest guar. by Albany Ry. Co.  Principal and interest guar. by  lbany Ry. Co.   Baltimore Md.   Date of Quotation-Apr 9, 1900							18428.500 in escrow to retire New Or leans Oity RR. Co.'s 1st mtg. bonds 1890.000 outstanding. New York Date of Quotation—Apr 9, 1800			1004			
United Electric Ry. Coist mtg g. 4s.  Saltimore City Pass. Rylst mtg g. 5s. Baltimore Traction Co	88,000,000 14,000,000 2,000,000 1,500,000 1,250,000 1,750,000 750,000 800,000 96,000 604,000 8,000,000 1,000,000	18,000,000 1,500,000 1,250,000 1,750,000 1,750,000 1,750,000 117,000 580,000 8,000,000 1,000,000	1949 1911 1929 1901 1942 1900 1906 1912 1982 1922	J & D, M. & N. M. & N. M. & S. J. & D, J. & J, N. & M. J. & J, M. & N, J. & D,	102 7434 11878 119 10416 121 101 10216 119 116 117	102¼ 75 120 121 ½  121 117	Atlantic Ave. (Brooklyn) Imp. g. 5s. Atlantic Av. (Brooklyn). Istgen. mig. 5s. †Atlantic Av. (Brooklyn) Cons. mig. 5s. †Bro'dway & 7th Ave. lst cons. mig. g. 5s. †Broadway & 7th Ave lst mig. 5s. †Broadway & 7th Ave 2d mig. 5s. †Broadway & 7th Ave 2d mig. 5s. †Broadway Surface 2d mig. 5s. †Broadway Surface 2d mig. 5s. †Brooklyn City RR. Co 1st cons. mig. 5s. †Brooklyn City & Newtown. 1st mig. 5s. †Brooklyn Belghts RR 1st. mig. 5s. †Brooklyn Heights RR 1st. mig. 5s. †Brooklyn, Q's Co. & Sub'n 1st mig. 5s.	759,000 8,000,000 12,500,000 1,500,000 500,000 1,125,000 1,000,000 2,000,000 1,000,000 1,000,000 250,000	1,966.000 7,650,000 1,500,000 500,000 1,125,000 1,000,000 6,000,000 2,000,000 448,000	1909 1981 1948 1904 1914 1924 1905 1941 1989 1988 1941 1941	M. & S. A. & O. J. & D. J. & D. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J.	95 107% 115 128 104 108 115 105 116 115 101 104 112 107	110 116 125 105 110 117 106 117 116
** All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.  BOSTON, MASS.  Date of Quotation—Apr 9, 1900 Lynn & Boston RRlst mtg. g. bs. West End Street RyDeben. g. 5s. West End Street RyDeben. g. 4½s. †\$1,674,000 in escrow to retire outstanding bonds of absorbed companies  Charleston S. C.	5,879,000 8,000,000 2,000,000	8,702,000 8,000,000 2,000,000	1902	J. & D. M.& N. M. & S.	114 104% 112	115 106	Brooklyn, Q's Co. & Sub'n. 1st cons. 5s. Brooklyn Rapid Transit	7,000.000 700,000 1,200,000 250,000 800,000 1,000,000 000 000 ,200,000 1,500,000 5,000,000 12,500,000	5,181,000 700,000 1,200,000 250,000 800,000 1,100,000 1,200,000 1,500,000 1,500,000 1,500,000 1,500,000	1945 1900 1902 1922 1908 1982 1914 1914 1910 1915 1998 1997 1909	J. & D. M. & N. J. & J. J. & D. F. & A. F. & A. M. & S. J. & J. M. & S. F. & A. J. & J. M. & S.	109% 101% 1017 125 101 117 102 108 116% 89 124 120 120 178%	108 109 108 120 106 117 125 121 109 117
Bate of Quotation—Apr 9, 1000 Enterprise Street RR1st mtg. 5s. Charleston City Ry1st mtg. 5s. Controlled by Charleston St. Ry.Co.	500,000 850,000	47,000		J. & J. J. & J.	106		Third Avenue RR lst mtg. 5s. Twenty-third Street Ry	5,000,000 150,000 2,000,000	850,000 5,000,000 150,000 2,000,000	1919 1987 1909 1906 1942	J. & J. J. & J. J. & J. F. & A	110%  106 118	112 128 108 116
Chicago III.  Date of Quotation—Apr 9, 1900  Ohicago Otty Ry	8,171,000	800,000 7,500,000 4,040,000 8,781,200 15,000,000 8,171,000 500,000 2,500,000 2,500,000 700,000 6,000,000	1908 1929 1929 1907 1982 1928 1942 1906 1911 1900 1927 1928 1911	F. & A. J. & D. A. & O. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. M. & N. J. & D.	1013/4  1085/6 106 101 1065/6	22/4 102  109  96%  111 102 107	151, westenesser Electric RR lat mig. 5s. 181,085,000 in escrow to retire gen. mig. bonds. 184,850,000 in escrow to retire maturing obligations. 18552,000 in escrow to retire lat and 2d mig. bonds. 2in treasury, 880,000. 1f Guar. by Union By. Co.  TOPONTO CANAGS.  Date of Quotation - Apr 9, 1900.  Montreal St. Ry	500,000		1908	J. & J. M. & S. M. & S.	110	114
W. Ohicago St. RR. TunnelIst mig. 5s. †Redeemable at option on 60 da. notice. †Funded debt assumed by Ohicago W. Nr. Ry. Co., controlling interest of rhich is owned by W. Chicago St. RR. Co., lessee. †Subject to call after Oct. 1, 1899, at 110 and interest.    Assumed by W. Chi. RR. Co., lessee.   Int. guar. by W. Ohicago St. RR. Co.   Cincinnati, C.   Date of Quotation—Apr 9, 1900   In. New. & Cov. St. Ry. lst Con. mig. g. 5s		2,500,000			118%	1141%	Date of Quotation—Apr 9,1100	800,000 100,000 150,000 250,000 500,000 1,125,000 5,698,210 200,000 1,800,000	810,000 200,000 100,000 458,000 867,000 200,000 1,018,000 100,000 500,000 29,724,876	1898 1901 1905 1911 1912 1948 1910	J. & J. J. & J. M. & S. J. & J. F. & D. A. & O.		
Mi. Adams & Eden P'k Inlst mig. 6s. Mi. Adams & Eden P'k Inlst mig. 6s. Mi. Adams & Eden P'k Inc. Cons.mig. 5s o. Cov. & Cin. St. Rylst mig. 6s. So. Cov. & Cin. St. Ry2d mig. 6s. † Assumed by the Cincin. St. Ry. Co. [\$250,000 reserved to retire 1st mig. bds.	46,000 100,000	46,000 100,000 581,000 250,000	1900 1905 1906 1912	A. & O. A. & O.	1081/4 114 1083/4 1211/4 1823/4	104  122½ 187	West End Passenger By 'string. 7s. West Phila. Pass. By	250,000 750,000	246,000 750,000	1905 1906 1926			
Cleveland, O.  Date of Quotation—Apr 9, 1800  Brooklyn Street RR. Co	800,000 8,000,000 2,000,000 8,500,000 1,500,000 1,000,000 200,000 600,000	2,500,000 2,000,000 1,249,000 1,500,000 1,000,000	1922 1909 1918 1918 1910 1922 1915	J. & J. M. & S. M. & N.	1061/4 1181/4 1051/4 106	107 114 % 106 107 	Date of Quotation—Apr 9 1900  Birmingham, Knox & Allentown	500,000 875,000 1,250,000 1,500,000 50,000 1,250,000 750,000 250,000 1,500,000 1,500,000 1,500,000 2,500,000	1,500,000 50,000 1,250,000 750,000 250,000 1,500,000 500,000 1,400,000 2,000,000	1980 1927 1980 1918 1942 1928 1924 1927 1929 1922 1980 1984	J. & D.	110	118
Detroit, Mich.  Date of Quotation—Apr 9 1100  Detroit Citisens' St. Ry	7,000,000 400,000 1,800,000	8,885,000 877,000 1,800,000	1902	A. & O.	105	102½ 106½	Newport Street By	500,000 9,000,000		1910	J. & D. M. & S.	116	118
New Haven Conn.  ; Date of Quatation- Apr 9 1:00  [ew Haven St. Ry	600,000 250,000 100,000 100,000	600,000 250,000 500,000 24,000	1914 1912	J&D M&N M&S	111 111 109 		St. Louis.  Date of Quotation—Apr 9 1:00  Raden & St. Louis RR	5000 000 1,600,000 2,000,000 1 900 000	250,000 1,603,000 1,500,000 000 000	1912 1907	J&J	100 -2 109 117	102 102 109 118

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PASSEN	PASSENGER RAILWAY.										
NAME.	Amo Authorized.		Due	Interest periods.	Bid.	Asked.					
St. Louis.				1							
Date of Quotation - Apr 9, 1.00	400,000	400.000		.,							
Jefferson Avenue By	1,590,000 1,000,000	400,000 1,500,000 700,000	1905	F. & A	108 108 105	105 104 106					
Missouri RB. Co	400,000 125,000	800,000 125,000	1910	M. & B. A. & O. J. & D.	100	102					
People's RR. Co		75.000 800,000	1904	M&N							
St. Louis & R. St. L. Electric. 1st mtg. 6s. St. Louis RR. Co	75,000 2,000,000	75,000 2,000,000	1905 1900	J. & J.	100	101 100 ⅓					
381. Louis & Sub. ByIst mtg. g. 58.	2,600,000 800,000	1,400,000 300,000	1921		80	104					
†Southern Electric RyCons. mtg. 6e. Taylor Avenue St. Rylst mtg. g. 6e.	500,000 500,000 1,091,000	500,000 500,000 1,091,000	1909 1918 1900	J. & J.	106 116 100	108 118 1001/6					
Union Depot RR. Co1st cons. mtg. 6s. Union Depot RR. CoOons. mtg. 6s.	8.500,000	1,787.000		J. & J.	121	122					
†Controlled by St. Louis BR. Co. †Controlled by Union Depot BR. Co. †Controlled by Lindell BR. Co.											
[\$200,000 in escrow to retire 1st & 2d mtg.											
28600,000 in escrow. ++8200,000 in escrow to retire 1st mtg.											
San Francisco Cal.											
Date of Quotation—Mar, 1900 Us. ifornia St. Oable BRlst mtg. g. 5s.	1,000,000			J. & J.	114	117					
fFerries & Cliff House Bylst mtg. 6s. Geary St., Park & Ocean BElst. mtg. 5s.	650,000 1,000,000	671,000	1914 1921	A. & O.		1 7 95					
Market St. Cable Ry. Coist mig. g. os. Metropolitan Ry. Colst mig.	8,000,00 <b>0</b> 200,000 2,000,000	2,000,000	1918  1918		1265						
Omnibus Cable Colst nitg. 6s.	2,000,000 350,000 250,000	850,000	1912	J. & J.	126% 105% 115	107					
Park & Ocean BB	700,000 1,000,000	700,000	1912 1918	M. & S.		125					
tControlled by Market St. Ry. Co.	. ,	·									
Washington D. C. Date of Quotation-Apr 9 1900	#00 000	450 000	1020								
Belt By. Co	500,000 500,000 200,000	450,000 560,000 200,000	1920 1914 1911	A. & O.	182	••••					
Metropolitan RB. CoCoil. tr. cons. 6s.	500,000		1901			•••••					
1850,000 in escrow to retire 1st mtg.bds. Miscellaneous.											
Date of Quotation—Apr 9, 1900  Bridgeport Traction Colst mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110					
Buffalo (N. Y.) By. Co Cons. mtg. 5s. to 'tizens' St. B. (Ind'polis) lst cons.m.5s	5,000,000 4,000,000	8,513,000 8,000,000	1938	F. & A. M. & N.	118 104	105					
Columbus (O.) St. Ry. (Buffalo)lst. mtg.5s.	8,000,000 8,000,000	2,366,000 2,261,000	1982	J. & J.	112 115	118					
Consolidated Traction (N. J.)lst mtg.5s (Crosst'n St. Ry. (Colu's, O.)lst mtg.g.5s Denver City Cable Rylst mtg. g. 6s.	15,000,000 2,000,000 4,000,000	18,965,000 572,000 8,800,000	1933	J. & D.	11:14	1113/4 115/5					
Denver Con. Tram'y CoCon. m. g. 5s. foursville (Kv.) Ry1st cons. mtg. g.5s.	4,000,000 6,000,000	922,000 4,981,000	1933	A. & O.	20 80 1:9	85 119%					
*Minneapolis St. Rylst cons. mtg. g. 5s +tNo. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	5,000,000 8,000,000	1,050,000 2,878,000	1928	J. & J.	110¼ 108	110%					
No. Hudson Co. Ry. (N.J.)2d rutg. 5s. No. Hudson Co. Ry. (N. J.)Deb. 6s.	550,000 500,000	550,000 489,000 1,000,000	1902	M. & N. F. & A.	::::						
Paterson (N. J.) Ry	1,250,000 8,000,000 5,500,000	2,000,000 4,298,000	1980	J. & D. A. & O.	1051%	106					
Paul Oity Ry	1,000,000	1,000,000			103	••••					
†\$1,000,000 in escrow to retire 1st and d mig. bds.											
†\$800,000 in treasury. Bonds guar. by Buffalo Ry. Co. †\$760,000 in escrow to retire bonds of											
C. St. RR. Co.											
18980,000 res'ved to redeem prior itens.											
ELECTRIC LIGHT AN	DELE	OTRIC	1		•With	OS.					
Boston, Mass.	) ELE	CIRIC		- 1017	J. O	<del>00,</del>					
Date of Quotation - Apr 9 1900	800,000	800,000		J. & J.	106						
Delaware Gas Lt. Co.,lst m. 5s, g. Edison Elec. Illuminating Oo., Boston General Electric Cogold coup, deb. 5s	2,025,000 10,000,000	8,750,000	1922	eguar.	167	•••••					
Pittsburg Pa	10,000,000	3,130,000									
Date of Quotation—Ap. 9, 1900 Allegheny County Light Co	500,000	,	1911	J. & J.	110						
Westinghouse Elec. & Mig. Co. Scrip 6s. Miscellaneous.—(Apr 9 1900.)	195,570	•••••		M. & S.	• • • • •	*****					
Mison El. Ilig. Co. (N. York) ist m. 5s Edison El. Ilig. Co. (N. Y.) con. m. g. 5s.	4,812,000 15,000,000	4,812,000 2,188,000	1910 1993		10 <b>9</b> 124						
dison Electric Light (Philadelphia)	5,000,000 2,000,000	5,000,000	1940		1221/	121					
Kings Co. El. Lt. & Pow. Co.1st mtg. 5s. Kings Co. El. Lt. & Po. Co.pur. money 6s	2,500,000 5,176,000	2,500,000 5,175,000	1937 1997	A. & O. A & O.	100 120	10: 122					
Wilwaukee El, Ry & Lt. Co.1st con. g. 5s. United Elec, Light & Power Co(N. Y.)	8,000,000 5,000,000	6,103,000		F. & A.	102}	••••					
TELEPHONE	AND	TELEG	R	APH.							
Miscellanegus.  Date of Quotation—Apr 9. 1900			1		1001/2	<b>10</b> 1					
American Bell Telephone	*******		1908	F. & A.							
N.Y. & N.J. Telep & Telg Oo. gen.mtg.5s Chesapeake & Potomac Teleph. Co5s.			1911	J. & D.	108	106					
ALLIED	INDU	STRIE	s.								
Miscellaneous.  Date of Quotation—Apr 9, 1900											
American Electric Heating	<b>600,00</b> 0	5 70.010				25					
Barney & Smith Car Co			1942 1904		106	107					
Worthington Pump Co	75,000				115	120					

## NOTES FOR INVESTORS.

Late quotations for copper are : Electrolytic, 16%@16%2.; Lake, 17@17%2.; casting, 16%@16%2.

The Strauton (Pa) Electric Light & Heat Company has been absorbed by the Electric Company of America.

The par value of the shares of the New England Vehicle Transportation Company has been reduced from \$100 to \$10—the amountpaid in.

From Boston comes a report that the Amalgamated Copper Company is earning at the rate of 18 per cent. per annum on its \$75,000,000 capital stock.

The copper market, holds firm with a fairly large business doing. The exports still continue very large. For the first five days of April they amounted to 2,232

The bill extending the power of the Rapid Transit Commission over all the boroughs of New York City was passed by the Legislature at Albany before it adjourned.

The following dividends were payble on Monday: Erie Telephone and Telegraph Company, 1½ per cent.; Michigan Telephone Company, 1½ per cent., and Wisconsin Telephone Company, 1¾ per cent.

A Detroit dispatch says that the Michigan Bell, and independent telephone exchanges were consolidated Saturday morning. All the independent telephones will be removed and the Bell system will number 14,000 subscribers.

For March the Metropolitan Street Railway Company, New York, reports green earnings as \$1,167,536, a gain over the like month last year of \$81,848; from July 1 gross aggregates \$10,514,586, a comparative increase of \$1,361,194.

The Imperial Electric Light, Heat and Power Company of St. Louis, Mo., has recorded a deed of trust to the Continental Trust Company and Louis Chauvenet of New York, in the sum of \$1,030,300, with a privilege of recording another deed for \$500,000 at pleasure.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 264@27j: New York Electric Vehicle Transportation, 124@13, New England Transportation, 64@7; Telephone & Telegraph Company of America 43@42; Gramophone 49@52.

The Brooklyn Union Elevated Railroad Company elected on the 5th inst. the following directors: S. L. Keeney, W. F. Sheehan, N. F. Brady, A. N. Brady, F. S. Flower, William C. Bryant, John Englis, John D. Kiely, T. S. Williams, John B. Taylor, C. L. Rossiter, Henry Siebert and J. G. Jenkins.

The Missouri & Kansas Telephone Company has placed a mortgage of \$1.125,000 on its plant with the Old Colony Trust Company to secure a new issue of bonds. The mortgage, placed on record Saturday, covers the company's property in the eighty-eight different counties in which it does business.

The Western Union Telegraph Company registered in New York on the 3d inst. a mortgage for \$20,000,000 to run 50 years at 4½ per cent. The Farmer's Loan & Trust Company is trustee. The Western Union building, New York, property on 5th avenue and 231 street, New York, and Chicago property are given as security.

The purchase of the Siemens & Halske Electric Company of America by the General Electric Company, which was denied on the 27th ult. by President Lloyd of the Siemens & Halske Company, is now confirmed. The control of the latter concern is said to have been resting for some time with the Weidner-Elkins syndicate who sold it out last week.

It is stated that the proposed new bonds of the Metropolitan Street Railway Company, to be issued to finance Third Avenue, are already being printed and that the deal with the underwriting syndicate has virtually been closed. The bonds will amount to about \$39,000,000 and will bear 4 per cent. interest. One authority says: "I think the bonds will bear the guarantee of the Metropolitan Company."

The New England Telephone & Telegraph Company of Boston has filed the following certificate of condition on February 28, 1900, with the Secretary of State: Assets—Real estate \$30.119; cash and debts receivable, \$1.585,162; merchandise, material and stock. \$586,649; plant and franchise, \$16.969 710; miscellaneous, \$820,667; total \$19.992,307. Liabilities—Capital stock, \$13,759,100; debts, \$4,387,866; reserve, \$754,755; balance profit and lose \$1,098,586; total \$19,992,307.

The to'al liabilities of the Forty-second street, Manhattanville and St. Nicholas Avenue Railroad, a part of the Third Avenue System, New York, were placed at \$3,279 390.13 in a report filed by Receiver Grant in the United States Circuit Court on the 4th inst. Among the liabilities are \$2,936,000 of funded debt, \$75.000 in loans on collateral, \$115.048 34 in unsecured loans, \$140,877 36 bills unpaid, and \$4 809 80 in conductors' deposits. The assets include 14 243 miles of track, real estate assessed at \$152,000 and rolling stock, etc., valued at \$189,020.36.

The American Telephone & Telegraph Company of New York, successor to the assets of the American Bell Company, has fi'ed the following balance sheet in Massachusetts: Assets—Real estate of \$1 380,560; equipment, \$3,849,630; plant, \$14,170,389; cash and debts receivable, \$8 320,735; supplies, \$310.852; patent rights, \$10,350; miscellaneous, \$65,673 968; total, \$93 116,454. Liabilities.—Capital stock, \$70,975,500; debts, \$19,105,837; reserves, \$935,635; profit and loss, \$2,099,482. total, \$93,116,454.

The New England Electric Vehicle Transportation Company, a New Jersey corporation doing business in Boston, has filed the following certificate of its condition March 1, 1900, with the Massachusetts Secretary of State: Assets—Land \$163 350; buildings \$112,719; machinery \$52,066; vehicles \$311.638; cash and dota receivable \$1.484; 63; stocks in process \$2 637; patent rights \$25,000, miscellaneous \$169 352; balance profit and loss, \$13 478; total \$2,274,236. Liabilities—Capital \$2,242,600; debts \$31,636; total \$2,274 235.

The transfer of the Bridgeport Traction Company of Connecticut by its Newark owners to A. M. Young and others of Connecticut was closed in Newark on the 3d inst. About \$24,000,000 worth of stock changed hands. The new company was organized by the election of the following officers: President, A. M. Young; vice-president, Randall Morgan: secretary, A. G. Runkle; treasurer, Lewis Lilie. The stock cost the Newark people from 20 to 32 and it was said that they received for it from 63 to 75.

An agent of the American Railways Company, of Philadelphia, has been making an examination of the capital Traction Company's properties, in Washington, D. C., in furtherance of the deal for their purchase. No secret is made now of the fact that the American Railways Company wishes to purchase the Washington line. The matter has resolved itself into the question of agreeing on a price simply and officers and prominent stockholders of the Capital Traction Co. acknowledge this much.

The Nisgara Falls Power Company of Buffalo recently filed with the New York Secretary of State a certificate showing an increase of capital stock from \$3.500,000 to \$6.500,000. The increase of \$3.000,000 is to consist of 30,000 shares. Up to and including April 1, 1995, the 3,000 shares are to be issued only at par and in conversion at par for 6 per cent coupon gold debentures of the company. The certificate or increase states that the amount of capital stock of the company actually paid in is \$3.331,000, and that its debts and liabilities consist of \$9,629,000 first mortgage bonds and other indebtedness of \$30,000.

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# FLECTRICITY

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#### SUBSCRIPTION RATES:

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## EDITORIAL NOTES.

United States
Marconi Patents.

On another page of this issue will be found a diagram and short description of

one of three patents issued by the United States Patent Office to William Marconi on April 10. All of these patents refer to the receiving apparatus and are of considerable importance.

As is now generally known Mr. Marconi obtained a patent on his system of wireless telegraphy in this country in 1896 with fifty-two claims, covering every known form of coherer and the coherer in combination with other apparatus. This fundamental patent described the combinations of a Hertz-Righi oscillator, Branly tube, electromagnetic tapper, capacities, and inductive and non-inductive resistances.

On May 9, 1899, another patent was taken out by Marconi which related to the enclosure of the receiving apparatus in an iron box, the principal claim reading as follows:

"The combination of a transmitter, a receiver, an aerial conductor, a metallic box containing the receiver, earth connections to one terminal of the transmitter and to the box, an interchangeable connection from the aerial conductor either to the other terminal of the transmitter or to one terminal of the receiver. a connection between the other terminal of the receiver and the box, a relay operated by the receiver, a telegraph instrument outside of the box, a connection between the box and one terminal of the relay, a connection between the box and one terminal of the telegraph instrument, a connection insulated from the box between the other terminals of the relay and telegraph instrument, a coil of insulated wire outside the box in the latter connection and a metallic covering to the insulation in connection with the box."

From this it will be seen that one connection is to be made by the metal of the box, while the second connection is made by a coil of insulated wire covered with tinfoil, but outside the box.

The next patent taken out in the United States by Marconi, namely, that which appeared on June 27, 1899, covered the use of an induction coil in the receiving circuit. The waves were to be transmitted through an induction coil, the primary of which was con-

nected with the aerial conductor, and the secondary with the coherer. It was claimed that "the use of the coil not only improves the signals, but also prevents to a great extent any interference due to atmospheric causes, as any atmospheric electricity collected by the aerial conductor escapes to earth through the primary of the coil, thus preventing a charge from accumulating and discharging itself through the coherer."

The three patents granted last week to the Italian inventor are numbered 647,007, 647,008 and 647,009 respectively. They are all similar in general principle, and differ only in detail and in the method of connecting up. They refer especially to the induction coil, as will be seen by the following claim:

"In a receiver for electrical oscillations, the combination of an imperfect electrical contact, a local circuit through it, an induction coil, the primary of which consists of two wires connected in parallel, wound in four layers, the first and second layers being formed of one wire, and the third and fourth of the other, the secondary of which consists of several layers, the number of turns in the outer layers being less than in those next the primary, a capacity connected to one end of the primary, a conductor connected to the other end, connections between the ends of the imperfect contact and the ends of the secondary, and a condenser in one of the latter connections."

This makes in all six patents that have been granted by the United States to Marconi for wireless telegraphy apparatus, and in this connection it should be noted that the three just issued are assigned by the inventor to the Wireless Telegraph & Signal Company, Limited, London.

Stockholders Will Now

Get Returns.

The stockholders of the Third Avenue Railroad of New York are at last on an "ascending scale"—that is, they now

something tangible in sight for their invest ments. The enormous debt saddled upon the road by reckless management—which forced the stock down from 200 to 45½—is to be taken care of by the Metropolitan Street Railway Company, and the prospects of the mismanaged road are now so bright that the stock was quoted yesterday at 112½.

At a joint meeting of the directors of both companies the Third Avenue Bailroad was

leased to the Metropolitan Railway Company for a period of 999 years, subject to ratification by the stockholders at a meeting to be held next month. According to the terms of the lease the Metropolitan guarantees principal and interest on Third Avenue bonds; during the first four years the Metropolitan will pay to Third Avenue stockholders all earnings above fixed charges and operating expenses; for the fifth and sixth years the Metropolitan will pay Third Avenue stockholders 5 per cent. on the capital stock of \$16,000,000; for the next four years the Metropolitan will pay 6 per cent. on the capital stock, and after the first ten years, and for the remainder of the 999 years, the Metropolitan will pay 7 per cent. on Third Avenue stock.

The plan adopted for canceling the old debt is for an issue of bonds guaranteed as to principal and interest by the Metropolitan Company, and secured by mortgage on the Third Avenue property. The bonds are first consolidated, are payable in gold, mature in 100 years, and draw 4 per cent. interest. The entire issue of bonds will amount to \$50,000,000. Of this sum \$35,000,000 have been taken by Kuhn, Loeb & Co., and the remaining \$15,000,-000 is reserved to retire prior liens.

President Vreeland says that the sale of the bonds insures the completion of the plans of development formerly entertained. The motive power of every line owned or operated by Third Avenue will be made to conform to that on the main road as the Metropolitan power house can furnish all the current necessary.

It is expected that within forty days there will be a termination of the receivership, and it is to be hoped that the vicissitudes of the road will prove a salutary lesson to directors who do not direct, but who, when financial troubles come, appear to be the suppliant tools of a merciless band of stockjobbers and a coterie of scheming politicians.

\*

Magnetism as a

From time to time we have referred to ex-Growth Stimulator. periments that have been made with the

electric current to ascertain its effect on the human system. As a cure for tuberculosis, when the disease has not progressed far, it is of value, and it is also claimed that by proper manipulation it can be made to retard, if not cure, certain forms of cancer. In this connection it is interesting to note that Prof. Herdman, of the University of Michigan, has been investigating the effect of the magnetic field of force on human beings and animals. Referring to this subject Prof. Herdman is reported as saying:

"Whenever a current of electricity traverses an animal body, the magnetic field resulting from the current and surrounding its path must disturb in some manner the molecular (physical) and atomic (chemical) activities that are going on in the tissues and fluids through which the current of electricity passes. Almost everything now known about electromagnetism seems to imply that a magnetic field, whether produced by a permanent magnet or by a current, reacts in some manner upon all kinds of matter within the field, and in such a manner as to rotate in some degree every molecule, so as to make it assume a different position from what it would assume if not thus acted upon. We have found that the most noticeably physiological response to an electric current obtained from living animals is that resulting from sudden and wide

differences in the intensity of the current. Having learned this, we have placed the human subjects of our experiments in a magnetic field occasioned by an alternating current. This produces no chemical changes in the body, but merely accentuates normal chemical action."

The apparatus which has been made use of in carrying out the experiments consists of a solenoid about three feet in diameter, through which an alternating current of five amperes is made to pass. In the case of animals, what might be termed a solenoid cage was used. These animals, which, by the way, were guinea pigs, were divided into two groups of about the same size and age, and were carefully weighed. Each group was subjected to conditions in all respects similar, except that from 5 o'clock each evening until midnight, one group was placed in the solenoid cage and subjected to a magnetic bath. This plan was pursued with each pair of groups selected from the time the animals were a few weeks old until they had reached their full growth. Commenting on the results obtained Prof. Herdman says:

"Without exception, the animals immersed in the alternating current began to outstrip the others in weight at the end of the first week and a gain of from 18 to 24 per cent. in favor of the animals within the magnetic field was apparent each succeeding week, until they neared the period of full development, when the weekly gain became perceptibly less.

"During two years ten separate groups of animals have been experimented on, each group containing from three to five animals, and uniformly those placed in the magnetic field gave evidence for the first few weeks of accelerated nutritive action. In the case of two groups, when the experiment was continued beyond eight weeks the curve of increase shown by the magnetized animals, which until then ran 20 per cent. higher than that of the other group, gradually declined; at the end of the twelfth week their weight had fallen a little below that of the other group."

As to the usefulness of his discovery Prof. Herdman observes:

"So far as these experiments go they appear to show that alternating magnetic stress is in some way related to a quickened metabolism of tissue; that the magnetic energy goes through some sort of transformation and reappears as physiological energy. Growth can undoubtedly be accelerated by the use of electricity, but it must be admitted that the growth thus obtained is unhealthy, and in the end is disadvantageous to man or animal. Such diseases, however, as rheumatism and gout will in time be treated successfully by methods similar to those employed in the experiments described, that is, by enclosing the patient for a short period each day until improvement is effected in an electro-magnetic field."

THE Paris Exposition was formally opened on Saturday, April 14. The ceremony of inauguration, which took place in the Salle des Fêtes was simple, consisting of music in the form of French national airs, followed by a speech by M. Millerand, the Minister of Commerce, in which the Exposition was handed over to M. Loubet, the head of the State. The President of the French Republic replied in a five minutes' speech, and at its conclusion the musical part of the programme was resumed with M. de Saëns' "Hymne à Victor Hugo," followed by M. Théodore Dubois' "Marche Héroique." As in the case of former World Fairs, all the exhibits were by no means in place on the day of opening, the Machinery Building especially being in a state of chaos. Competent judges estimate that at least a month or six weeks must elapse before the great Fair on the banks of the Seine will have reached completion.

## UNDER THE SEARCHLIGHT.

#### Notes and Comments on Various Topics.

Gov. Roosevelt will give a hearing to-morrow, April 19, at Albany, at 3:30 P. M., on Assemblyman Sullivan's bill amending the act relative to the powers of electric light companies to condemn lands.

THE electric pumping station at Cerrillos, N. M., is now in operation, forcing a four-inch stream, three miles, to Madrid for the big electric power plant located there.

THE postoffice authorities at Denver, Col., have recently purchased an electrical stamp canceling machine. This is the third one installed there.

IT is reported that Miss Annie Mitchener, daughter of the owner of a trolley road running from Canal Dover to Unionville, O., a distance of 13 miles, is superintendent and manager of the line.

THE steamer Penobscot, of the Boston & Bangor Steamship Company's fleet, has recently been wired for electricity. Besides being fully equipped with electric lamps throughout, she will also be furnished with a powerful searchlight.

MR. GEORGE F. PORTER writes us that a special rate of railroad fare-being a fare and onethird for the round trip-has been granted by all the passenger associations for delegates attending the Twenty-third Convention of the National Electric Light Association to be held at Chicago May 22, 23 and 24.

THE plans for the new Philadelphia mint call for a large amount of electrical ma chinery including fourteen 45-horse-power motors for the coining department, sixteen 5-horse-power cutting motors, six 25-horsepower finishing motors, and one 5-horse-power hydraulic motor. An electro-refining equipment is desired for the melting and refining departments.

On April 14, an automobile race took place between nine members of the Automobile Club of America, the prize being a cup presented by a member of the Automobile Club of France. Fifty miles was the distance of the contest, the course being over the famous Merrick road, on Long Island, with start and finish at Springfield, and the turn at Babylon. Mr. A. L. Riker, driving the only electric motor car in the list of entries, easily out-speeded gasoline and steam, and covered the half cantury in 2 hours, 3 minutes and 3 seconds, or at a rate of speed of a mile in about 21 min-

The dangerous Diamond Shoals, at the outer edge of Cape Hatteras, are to be marked by a new lightship, a much stancher boat than those now in service off that dreaded spot. For many years it was deemed impossible to maintain a light there, but during the past two



years the Government has demonstrated the practicability of lighting the shoals, despite the occasional blowing adrift of the lightship during the hurricane months. The new ship, however, will have her own power to bring her back, should the enormous mushroom anchors with which she is to be provided fail to hold her. Electrically lighted, she will be a vast improvement over anything heretofore attempted in lightship construction.

ELECTRIC power is being transmitted over an aluminum cable three-eighths of an inch in diameter over a circuit eighty miles long at Provo, Utah, according to H. R. Newcomb, one of the large stockholders in the Telluride Power Transmission Company, which owns the Provo plant. Mr. Newcomb is a banker of Cleveland, Ohio, and has recently returned home. "We are generating about 2,000 horse-power," he said to a reporter, "and sending it to the mines at Mercur and Tintic. We have a demand for all the power we can furnish, and shall enlarge our plant at once to 6,000 or 8,000 horse-power."

WILLIAM BROWN, of Brooklyn, the cycle rider who last fall broke the 1,000-mile road record, will soon start on another record-breaking bicycle ride over the Long Island course. This time he will ride 2,000 miles, and has engaged multicycles and automobiles for pace. He has secured from villages through which he expects to pass permits for high speed, and hopes to break every record from twentyfour hours to six days. Motor cycles capable of running seventy-five miles without a stop at a speed of forty miles an hour will alternate in pacemaking with automobiles capable of fifty continuous miles at twenty-five miles an hour. The start will be made May 12, and the ride, with the exception of a short rest each day, will continue seven days.

The Chicago Telephone Company has entered into an arrangement with the Home Science Bureau of the Chicago Woman's Clubs, whereby it is now able to supply servants, chaperons, or women to take charge of weddings and social functions. The telephone company also takes orders for the removal of trunks and baggage, and will summon to its subscribers' aid the fire or police department if desired. The bureau assumes the responsibility for the domestic help supplied.

PHILIP P. NUNGESSER, superintendent of the Nungesser Electric Battery Company of Cleveland, O., has invented a new primary battery, which promises to be a valuable factor in automobiles. The battery "is designed especially for electrical ignition on gasolinepropelled vehicles. One of the features is that no oil is used on the solution of this battery. It is said that in all closed circuit batteries having an alkaline it is necessary to use a heavy paraffine oil on the solution to prevent it from decomposing. Oil is said to be unnecessary in Nungesser's battery. When used for motor vehicle ignition this battery has a capacity of about 3,500 miles. The total weight when ready for use is seven pounds."

At the Hotel St. George, Brooklyn, last Friday evening, Mr. George T. Hanchett, assisted by Captain J. McLeod Murphy and Mr. Clinton E. Whitney, gave an interesting talk on "Experimental Work with Electricity at Very High Pressure, Wireless Teleg-

raphy, the X-Ray and Illumination of Vacuum Tubes." Mr. Hanchett described experimental work with electricity at very high pressure and high tension discharges, explaining their character. There were experimental illustrations showing various forms of high tension. The third programme number was "Molecular Bombardment and Light Effect Produced Therefrom," illustrated by tubes of various degrees. Following this came ether vibrations, both visible and invisible. This included the electro-magnetic vibrations of wireless telegraphy and the X-ray. The last experiment was the exhibition of the Murphy Safety Electric Company's system of third rail propulsion, for which a working model was put in operation. Mr. Murphy said: "The overhead wires are a source of danger, and a new system, which was sought after by 588 inventors, has at last been This new system combines all the found. good qualities of the other system and eliminates the poor qualities." Mr. Murphy advanced the theory that within a year there would be a trolley line from New York to Bos-

J. M. FORDYCE, of Detroit, Mich., has secured permission from the State Boardof Public Works for experimenting with electric propulsion of canal boats on the Miami and Erie Canal. He will be permitted to select a stretch of ten miles in the vicinity of Toledo on which to construct his apparatus. He must begin within one year, and two and one-half years are given for the experiments to be made in. If successful he is to be given the right to operate his boats on the canal between Cincinnati and Dayton for 25 years, paying the regular tolls for the privilege.

It is expected that the citizens of Ottawa. Ont., will display their characteristic spirit of cordiality to the visiting delegates on the occasion of the convention of the Canadian Electrical Association, which will take place at the capital of the Dominion on June 27, 28 and 29. Arrangements are already well advanced for the convention. About six papers are to be read, and are looked forward to as being of the most interesting and instructive character to the electrical profession. Among these papers will be one read by R. B. Owens, professor of electrical engineering of McGill University, Montreal, on "Utilizing the Available Central Station Capacity," and another by Mr. F. H. Leonard, electrical engineer for Messrs. Pringle & Son, Montreal, on the "Effect of Power Factor on the Operation and Investment," with special reference to induction and enclosed arc lamps.

THE German rights in the Stone system of electric lighting of railway trains, described in the issue of Electricity of June 7, 1899, have been acquired by the Accumulatoren and Electricitatswerke Gesellschaft of Berlin.

The Holland submarine boat has been purchased by the Government. The boat becomes the property of the Government for \$150,000, but the Government will deposit \$90,000 of that amount with August Belmont & Co., of New York, in trust for the Holland Submarine Torpedo Boat Company, as a guarantee that the Government will suffer no loss for the money it advanced for the construction of the submarine torpedo boat Plunger. The money deposited with Belmont & Co. will be paid to the Holland Company when the Plunger has been accepted by the Secretary of the

Navy. The contract gives the Government the right to purchase the patents of the Holland submarine craft at any time, and provides for the appointment of a board, to consist of two naval officers, and one representative of the Holland Submarine Torpedo Boat Company to fix the price of the patent rights should the Government decide to buy them. The company binds itself to furnish other boats similar to the Holland should the Government want them, the price of each to be agreed on later, but not to exceed \$170,000. It agrees also to provide a crew for a reasonable length of time to instruct naval officers and seamen in operating the Holland.

A PORTABLE searchlight has been brought out. The arc is in the form of a Mangin mirror, having a diameter of seven inches. The lamp is so arranged that it can easily be brought in or out of focus, so that the beam may be concentrated or diffused as desired. The total weight of the lamp is fifteen pounds in aluminum or twenty pounds in brass.

It is reported that the French Aéro Club has received from an anonymous donor the sum of 100,000 francs, which is to be given to the aeronaut who, with a balloon, or any other aerial vessel will start from the headquarters of the club, pass round the Eiffel Tower, and return to the starting-point, a distance of seven miles, within half an hour. This competition is international. If the prize is not won within five years, it will be withdrawn. These experiments would no doubt be very interesting to the anonymous donor of the prize. but we should think, says the London "Electrical Engineer," that such experiments were scarcely suitable for trial over a great city like Paris, and in our opinion the sea would allow one a rather better chance if the machinery suddenly failed, and the sea would also in that event suffer less damage than the Paris public.

THE engraving of metal dies by electrolytic etching is a new process that a German company expects to work extensively. A plaster negative of the original is saturated with the electrolyte, and connected to the negative pole of a source of electricity, the metal plate to be etched being attached to the positive pole. As the cast and the plate touch, the circuit is closed, causing the metal to be dissolved at the points of contact. To get good results, the contacts must be but momentary, the insoluble particles in the metal being brushed away after each, and the accurate repetition of the touching at the same points is effected by an automatic machine, which also operates the brushes. The etching of a steel plate to a depth of onetwenty-fifth of an inch requires 600 to 700 contacts, of about 12 seconds each, the whole precess occupying 4 or 5 hours. The best electrolyte for etching steel is a ten per cent. solution of chloride of ammonium with a little hydrochloric acid, and the best current is 1.3 amperes per square inch at 8 to 12 volts, but the voltage must be smaller at the beginning, when only the points of the negative cast touch the metal.

#### Proposals Invited.

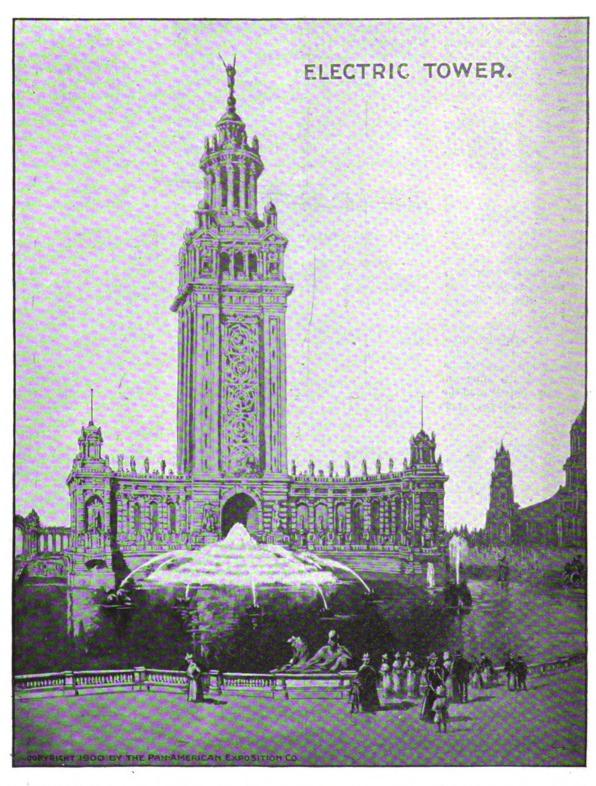
Sealed proposals are being invited until May 10, for furnishing the office of public buildings and grounds, Washington, D. C., with a quantity of electric battery supplies. Full information can be obtained upon application to Col. Theo. A. Bingham, Washington, D. C.



#### THE ELECTRIC TOWER AT THE PAN-AMERICAN EXPOSITION.

The dignified and stately beauty of the great Electric Tower, which will form the conspicuous center-piece of the Pan-American Exposition at Buffalo next year, will command the rapt admiration of every visitor. The genius of the architect has been taxed to preserve lines and elements of beauty in a work of such be seen by the accompanying illustration, is flanked on the east and west by long curved colonnades, which sweep to the southward and terminate in airy pavilions, forming a semicircular space 200 feet across. Within this space and in a high niche in the main body of the Tower are cascades, while all about the basin are leaping jets and countless playful figures, each with its spurt of water, combining to make a brilliant water scene. At the center

an aspect of great solidity to the base. The shaft of the Tower is treated with great simplicity. The center of each side is paneled with fantastically perforated work, through which is indistinctly revealed the massive framework of the Tower. This feature is calculated to produce a remarkable effect when lighted from within, as it is the intention to do. The main shaft of the Tower terminates in an elaborate entablature at the height of



tail proportions, but the problem has been well mastered.

The height of the tower is 348 feet above the surface of the broad basin in which it stands. Its position is between the Court of the Fountains and the Plaza, on the north side of the Mall. It looks down upon the Agricultural Building at the east and the Electricity Building on the west. The Tower proper, as may

of the niche is a tall geyser fountain, whose waters find their way from the high basin within the niche over successive ledges and among a multitude of vases to the level of the pool.

The main body of the Tower is eighty feet square. From the surface of the water to the top of the colonnades is seventy-five feet. This portion of the structure is enriched by a system of decorative rusticated bands, which give 200 feet. The crown of the Tower rests upon thi entablature, and is composed of three stories of diminishing proportions and varying design. The lower of these stories is an arcaded loggia, rich in ornamentation and having the wall surfaces brilliantly colored. Pavilionettes at the corners terminate in light fantastic cupolas. The second stage, or lantern of the Tower crown, is in the form of a high, circular colon-

nade, entirely open, so as to allow the effect of the sky to be seen between the columns. A spiral staircise within the colonnade leads to the last stage of the Tower, the cupola, over whose soaring dome is poised the superb figure of Electricity herself, thus dominating the entire Exposition, which owes so much to her generously exerted power.

From the water to the feet of the figure of Electricity is a vertical distance of 331 feet. The figure is seventeen feet in height.

The entrance to the Tower is across an ornamented bridge from the Plaza, on the north side. Elevators will carry passengers to the various floors, which will be devoted to different purposes of the Exposition, such as reception rooms, offices, restaurants, belvederes and amusement halls. A large restaurant, at a height of 200 feet, will give the diner a broad and beautiful view of the Exposition and the surrounding landscape. From the cupola the eye can sweep the whole Niagara frontier, and look far into Canada, beyond the majestic river that separates that country from the States.

Sculpture plays an important part in the decoration of the Tower. Two magnificent monumental groups of statuary flank each of the four sides of the base. Above the water niche in the southern face of the Tower is a magnificent escutcheon, representing the arms and seal of the United States. In the spandrels of the arch above the niche are sculptures in high relief. The pavilions and wings are also richly decorated with sculptures and other architectural devices. The entire exterior of the Tower will be studded with myriads of electric lights, so arranged that a great variety of effects can be secured. The use of electric lights in combination with the sparkling fountains and cascades will produce scenes of fantastic beauty.

#### THE ELECTRIC AUTOMOBILE.\*

BY A. L. RIKER.

In presenting this paper on the electric automobile for your consideration and discussion to-night, I will endeavor to clear up a few of the mysteries surrounding this type of vehicle. and demonstrate the advantages it possesses over all other forms of motor vehicles. In purchasing a vehicle -an automobile-for pleasure driving, one is naturally anxious to procure a vehicle that will require the least possible attention from the operator, which condition is met alone by the electric automobile. This may seem to be a very positive statement, but I shall prove it to be correct. To begin with, we must have a basis of comparison, and for this we must turn to that most widely used and popular method of vehicle propulsion, the hay motor, commonly known as the horse. My reasons for referring to him are as follows: You are all probably more familiar with this "motor" than any other and know how he automatically overcomes changes in his work. For instance, driving along a road, and arriving at the foot of a hill, your horse puts forth the extra effort necessary to accomplish the additional work without any attention on your part, and this is true only of the horse and the electric motor. All other motors require some manipulation, however slight, on the part of the operator. Another feature that they possess in common is the ability to exert the greatest traction effort at the lowest speed.

\* A paper read at the 204th meeting of the New York Electrical Society, New York City, March 22, 1900.

Again, the fact that you can greatly overload them both for short periods, is common only to these two powers. Under these conditions we do not require any changes of gearing in the electric automobile to alter the speed, or to climb a grade, but accomplish this electrically by a series of switches, so grouped as to be operated by one handle, and which I shall designate hereafter as the controller. From this controller wires lead to four groups of batteries, and to the motor or motors as the case may be. At this point I will state that there are a number of different arrangements for varying the speed of electric automobiles, but I think that this one is the best, and most commonly used, and a description of this method of speed regulation will be of more interest and value to you. As the speed of an electric motor depends upon the pressure of the current supplied, you will at once see that change of pressure means also change of speed. This pressure, in technical language, is called voltage. As it is necessary when re-charging the batteries to connect them to a direct current. each cell requiring about 2.5 volts, and as the prevailing pressure is in the neighborhood of 110 volts, it is necessary, if we desire to charge economically, to use from 40 to 44 cells of battery. These are placed in four crates or boxes, each holding ten cells. The cells in each crate are connected in series, that is to say, the positive terminal of one is fastened to the negative terminal of the next. As the pressure of a cell on this charge is about two volts, and there are ten in a crate, the pressure at the terminals of each crate is approximately 20 volts. Now it is possible to so connect the four boxes that we obtain three pressures, namely, 20 volts, 40 volts and 80 volts. The controller changes the connections of the four sets of crates, and enables the various pressures to be supplied to the motor. In the first position the four crates are connected so that the motor receives a pressure of 20 volts. As they are now connected in multiple, each crate furnishes one-fourth the total current; for example, if the motor takes 20 amperes, each box is furnishing five. This arrangement allows all of the cells to discharge at the same This method of control has another time. very advantageous feature. If one of the crates should show signs of being discharged before the others, by leaving the controller in the first position for a short time, the other crates will charge the weak one, and save those cells from over-discharge and possible injury. In the second position of the controller, the crates numbers 1 and 2 are connected in series, as are also crates 3 and 4. These two sets are then grouped in multiple and furnish a pressure of 40 volts to the motor. In this second arrangement only one-half of the total current is supplied from each crate; therefore if the discharge is as before, 20 amperes, each crate or box is furnishing ten. In the third position we have the greatest pressure we are able to produce. In this position all the crates are connected in series, and the pressure supplied to the motor is 80 volts, and the total current of 20 amperes is furnished by each crate.

You see that by the above combinations we are able to produce three pressures, which correspond to three different speeds of the carriage. Of course, it is possible to increase the number of speeds by using more than four crates. For instance, six crates will give four speeds. But experience has shown that three speeds are sufficient and have been adopted as

a standard arrangement for electric vehicles. These speeds are about as follows: First position, from 0 to 3½ miles per hour; second, from 3½ to 7 miles per hour; third, from 7 to 14 miles per hour. It is also possible to have these three speeds for backing, but practice has shown that two are sufficient.

I now show you the complete controller and the lever for operating it. When you remember that the forward and reverse speeds, as well as the shutting off of the supply of power to the motor are all done by this one lever, you can see how easy it is to operate an electric carriage. For instance, you take your seat, placing one hand on the steering bar and the other upon the controlling lever. The most natural thing to do is to push the lever in the direction you wish to go. If you desire to go ahead, the lever is pushed in that direction, and the carriage immediately responds, without jerk, jar or noise. Wishing to increase the speed, you push the handle further, and the carriage responds. When you wish to stop, what more natural than to pull the lever back and apply the brake. Now, you may wish to back your vehicle. By pressure of your thumb, you release a catch that prevents accidental reversal and pull the handle back. The carriage immediately goes backwards. Nothing could be more simple or easier to operate, and I think that in this you will agree with me.

As it is necessary to know how much electricity we have stored up, and how fast this is being consumed, we use a combined volt and ampere meter. I think at this point it would be well to explain that the difference in pressure between a fully charged storage cell and the same discharged, is about three-tenths of a volt, being two volts at the beginning and 1.7 volts at the end of the discharge. With 40 cells, the pressure at the start is 80 volts, which falls gradually to 68 at the finish. meters are therefore marked in this manneropposite 80 volts the word charged is written and discharged against 68. You can therefore spin along at ease until, while running on a level stretch of road at a normal discharge, your meter reads 75 volts. You know then that you have used half your charge, and that you must either return or find some means of recharging. This device has been in constant use for over three years, and I have never known anyone to run out of a charge if they went by the reading of the meter. I have so far explained only one side of the meter, and how it operates on discharge or the running of the carriage. It has still another function. When a storage battery is connected to a source of current to be recharged, the back pressure of a cell is about 2.1 volts, making the 40 cells require 84 volts to recharge them. As they absorb the charge, their pressure gradually rises to 2.5 volts per cell, or 100 volts for the 40 cells, at which pressure the charging should be stopped, as the battery is full. The meter also indicates this condition. As it is also necessary to know at what rate to recharge the cells, the other half of the instrument is graded in amperes. This portion of the meter has a double scale, reading either the amount of current going into or out of the battery, enabling us to charge at the proper rate for the best results. to the battery, and when running, shows the amount of power being used. It is therefore possible with an electric carriage, and one of these meters to know at any time just what horse-power you are developing.

As it is absolutely necessary in recharging a battery to connect the positive terminal of the



tattery to the positive charging wire, and the negative battery terminal to the negative wire, some means must be devised making it impossible to connect them incorrectly. This can be accomplished in a number of ways. The one that has been most generally adopted consists of two parts, the socket, which in practice is fastened to the carriage and the positive and negative battery wires being attached to the two rings, the outer of which is positive and the inner negative. Fitting this socket is the plug which is connected by a flexible cable to the source of current for charging. This plug consists of two concentric tubes which encircle and make contact with the rings in the socket. You will therefore see that to recharge, it is only necessary to insert the plug in the socket, and close a switch, it being impossible to connect the charging wires incorrectly.

A crate of batteries, four of which constitute the equipment, are provided with handles, so that they can be easily removed from the vehicle, and making it possible, by having two sets of batteries, to keep the carriage in constant service. The wires from the controller connect to these crates and are clamped by the thumb-screws at the end of the crate, making it possible to take out an exhausted battery and replace it with a fresh one inside of five minutes. A motor, the apparatus that transforms electric into mechanical energy and propels the carriage is probably the most perfect of any power transforming device, having an average efficiency of 80 per cent. and especially adapted to vehicle propulsion, exerting a continuous rotary effort, capable of being overloaded from 100 to 300 per cent., and responding to every call made upon it. Noiseless and without vibration, it is and always will be the ideal motor for automobiles.

As you all know, when turning a corner, one wheel of the carriage must travel faster than the other. This can be accomplished in several ways with the electric automobile. This is what is called the single motor running gear, and the differential action of the wheels is accomplished by the well-known method of making the driving axle in two parts, each half being keyed to a wheel and connected to each other by a system of gears. This arrangement is generally used for light carriages. Here is an entirely different method of obtaining the same effect. In this arrangement, the differential and single motor is replaced by two motors, each directly geared to a driving wheel. The motors are so connected electrically that the same results are obtained as from the differential gear, that is, if one wheel and motor have to go faster than the other it can do so. This double motor equipment is used mostly for the heavier types of vehicles. Having shown that the electric possesses advantages over all other types of vehicles, why is it that any others exist? It is for this reason, and this alone that the radius of the electric vehicle at present is limited to about 30 miles. If we could increase this radius of action to 90 or 100 miles, what one of you would think for one moment of any other motor? Even the competitors of the electric vehicle admit that its advantages far outweigh its disadvantages. Now let us look at the latter from the standpoint of the gasoline or steam vehicle manufacturer. First, the limited radius of action; second, the excessive weight; thirdly, the short life of the batteries, and finally, the great cost per mile. To refute these statements I have facts which were compiled from actual data. In regard to the radius or action, I will say

that there are on the market to-day electric vehicles capable of making 50 to 75 miles on each charge of the battery, and I have a report of a carriage in France that has covered 108 miles on a single charge. This carriage weighed complete about 2,200 pounds. Further, I believe that inside of six months a light, electric vehicle will be produced, not exceeding 1,000 pounds in weight, that will be capable of carrying two passengers fifty miles on one charge. This disposes of the first two statements. The last two can be brought under one head, as in the cost per mile, the life of the battery must be taken into consideration. It has been published by competitors of the electric carriage that the cost of operation was five cents per mile. This is delightfully vague, as they do not state whether this is simply the cost of current for recharging or if they include in their figure the depreciation of the batteries. However, they have certainly put their estimate at a remarkably high figure. To offset these erroneous statements, I will give you a few facts as to the cost of operating electric vehicles, which data is not theoretical but compiled from actual running expenses of a pleasure carriage. The vehicle that I have reference to and from which this data was obtained, has been in almost constant use since 1897. During this period it has covered over 20,000 miles. The cost for battery maintenance has been \$150, or \$ of a cent per mile. The current, as supplied with the regular Edison Company's rate of ten cents per horse-power hour adds 14 cents per mile, making the total cost 2½ cents actual as against the theoretical statement of the gasoline manufacturer 5 cents per mile.

As these figures just given are based on the present weight and capacity of the storage battery, let us indulge in a little speculation as to what we could accomplish with a battery giving from two to three times the capacity per pound over those in use to-day. As the weight of the battery is about 40 per cent. of the total load carried, and we are designing a vehicle to carry two persons, we will assume that our carriage and its occupants will weigh 1,300 pounds complete. Of this total weight 500 pounds will be in the batteries. Now, our normal speed will be 15 miles per hour. To drive our carriage at this rate requires two horse-power, and as our battery has this capacity for 4.5 hours, it is plainly to be seen that we should be able to cover between sixty and seventy miles on one charge. These figures are based on good macadam roads, with practically no hills. The cost per mile to operate such a carriage would be 1.5 cents with current at the regular Edison rates. I stated this as a supposititious case, but as I have before stated, I expect to see such a carriage in a very short time. I hardly think it necessary to enlarge upon the advantages of the electric automobile, but it is the only carriage that a lady can operate, and it also appeals more to our asthetic taste than any other form of motor.

#### Lord Kelvin's Rail Tester.

Lord Kelvin has invented an ingenious form of trolley rail tester. For making contact on the rails a graduated bar has attached to it two steel contacts. These contacts are provided with terminals which are connected by means of a flexible wire to a voltmeter. The latter is located in a box provided with carrying straps. The indications of the instrument show directly the resistance of a rail bond or section of rail,

THE EVOLUTION OF SAFE AND ACCURATE FUSE PROTECTIVE DEVICES.\*

#### BY JOSEPH SACHS.

#### (Concluded from page 215)

OPERATIVE PRINCIPLES OF ENCLOSED FUSES

The satisfactory operation of an enclosed fuse is based on a careful consideration of the following:

- 1. The character, size and form of the fusible strip.
  - 2. Length of active fusible strip.
- 3. The character and mass of the fuse environment.
- 4. The interior section and length of the enclosing easing.

To these may also be added the necessity for indication, compact size and facility of manipulation and low cost.

The character of the metal employed is of the greatest importance, since the heated gases and pressures consequent upon the disruption of the fuse in the casing, and the tendency to arc and explode, is governed by the mass of metal to be disrupted at any particular current condition and voltage, and the conducting nature of its vapors.

The commonly used lead-tin alloy fuse metals by no means possess the desired characteristics. It is true that fuses composed of such metals do not, on disruption, give rise to as highly conducting vapors as copper; but owing to their comparatively poor conductivity and low melting point, they essentially must embody a large mass of metal in any fuse of given length, due to the ample section required. The severe oxidation of such fuse alloys and the possible change in molecular structure of alloys of this type subjected to repeated heating and cooling must not be overlooked.

The search for a satisfactory fuse metal seems now to be directed toward such metals as aluminum, cadmium, tin, zinc and those of a similar nature, or their alloys. A simple metal is, however, more desirable for this purpose, unless the alloy possesses features which cannot be obtained otherwise. Since the desired metal must be cheap, aluminum and zinc at once become most attractive. Both possess the desired conductivity, and melting point and their vapors have the desired high-resistance property, which is, no doubt, due to their extremely rapid oxidation. The mass of metal used in fuse wires of either of these is therefore small, and the opening of the arc is readily accomplished. These two metals have up to date been generally adopted in the writer's various forms of fuse devices, but it is still desired to further advance in the direction noted. Since the carrying capacity of the wire depends upon its ability to throw off more or less of the heat generated therein, it necessarily follows that a single round sectioned wire does not attain the desired goal in regard to the use of a minimum mass of metal. The simplest solution is to flatten the fuse strip and thus raise its heat-throwing-off ability to a maximum. Another method is to construct a fuse strip of a multiplicity of wires. The first method is used by the writer in all larger fuses exclusively, and performs another function which greatly adds to the operation of the enclosed fuse and permits the use of smaller tube sections. In . order to effect a thorough and rapid commingling of the ruptured wire and filling material, it is essential to bring the maximum metal sur-

<sup>\*</sup> Abstract of paper read at the 141st Meeting of the American Institute of Electrical Engineers, New York, March 28, 1900.



face in contact with the filling, which is very well attained by the use of a flat strip.

In fuses intended to work on the various commercial voltages it has been the practice to vary the length of the fuse strip in proportion to the voltage. Owing to the decreased carrying capacity of any particular fuse wire section due to increased length, it is highly advisable to reduce the latter to a minimum, consistent with satisfactory working.

The varying severity of short-circuit effects at different parts of the conducting system with large and small generating capacity and with varying conditions of output and character of service, are frequently ignored in considering the operation of protective appliances of this nature. With heavy current capacity protective devices a very small retarding medium greatly affects the operation of the protective device. Short-circuits and heavy over-load ruptures, on large over-compounded and low-power factor systems are instances of particularly severe service.

It is, however, only necessary for a protective device such as a fuse to accomplish satisfactory results on the particular service in connection with which it is used. While it is entirely possible to provide a device capable of meeting the most extreme condition, such ability, if entailing additional cost, is unnecessary where the extreme conditions are impossible. The peculiar result obtained in a recent test made by short circuiting two of these solid packed fuses on a 2,500-volt line and two exactly similar fuses on a 500-volt line, will illustrate the fact that the voltage does not necessarily determine the severity of the short-circuiting effect on a fuse of ample dimensions.

The use of inductances in series with large fuses to choke heavy current rushes and thus ease the blow on short-circuit, has been suggested. Recent tests with 600-ampere fuses on a very heavy feeder at a short distance from one of the largest 500-volt direct connected railway stations, has somewhat lowered the writer's opinion of this buffing device. One of these fuses tested without the inductance and thrown directly as a short-circuit across the feeders worked in a far superior manner to another having an inductance of about twelve turns in series with it and similarly treated. Indications seemed to warrant the conclusion that while the inductance may have choked the maximum rush, it, however, increased the potential of break across the fuse terminals.

Another important feature dependent upon the length of fuse, its consequent resistance and amount of energy dissipated therein, is the temperature attained by the surface of the tube casing. This depends upon the amount of heat delivered from the fuse to the environment and consequently upon the amount of energy dissipated in the fuse for any particular current. A simple arrangement of the strip section, small in the center and increasing toward the terminal wires, accomplishes most excellent results in this direction. Fuses so constructed have a far lower tube surface temperature than when an even strip is employed, although more metal must necessarily be dissipated.

The desired result as to so-called hot and cold blowing of the fuse device is accomplished by reducing the mass of environment to a minimum. It is obvious that with a certain fixed heat-throwing-off capacity in the wire, the current carrying capacity of the latter will depend upon the rate of heat conduction to, and dissipation by radiation from the tube surface, and

by conduction longitudinally through the terminal wire and environment to the contact posts. The heat conductivity of the environment therefore governs the varying capacity of the complete device, but this function is decreased if insufficient environment section is provided, so that the radiation and conduction therefrom, owing to lack of tube surface, is not in the proper proportion to the amount of heat thrown-off by the conductor. The exterior surface temperature of the tube, other conditions being fixed, is certainly dependent upon the surface area. Decreased surface temperature can therefore be obtained by increased surface area, but this necessarily entails increased mass which is not desirable, for reasons already given. For similar reasons it is desirable to minimize the heat conduction from the fuse to the contacts, through large terminal wires.

By a careful adjustment of the various parts the writer has obtained comparatively low surface temperature, minimum ratio of hot to cold blowing time and practically no difference in the current carrying capacity of the fuse strip, from that which it has when entirely surrounded by an air environment.

To produce the desired result relative to the prevention of any holding of the wire in a molten condition, a very careful experimental investigation was undertaken. Based on the original conception, the writer has developed a combination of elements which not only combine under heat action of the current, but in which the character of all or a portion of the environment is such that the retention of the wire continuity after melting temperature has been reached is impossible. This result is accomplished by the use of a material around the wire which readily fluxes with the metallic oxides of the temperature at the molten metal. Various substances are available for this purpose, but the writer has found mixtures in the form of loose, finely divided powders, in which borax is included as an element most desirable. With the metal employed in the fuse strip, this environment produces most peculiar results, causing a fluxing only upon the attainment of the temperature reached by the wire in its molten overloaded state.

By the use of such combining material around the fuse strip, other features of advantage are obtained. The combination between the metallic oxides with the environment absorbs the energy of any destructive arc or resulting explosive effect, which may tend to maintain itself under other conditions. The combination of the elements in the manner described is, however, equally as valuable in buffing the break, as a long continued and gradually lengthened arc. The merging together of the metal of the fuse strip and material of the environment necessarily causes a gradual increase in the resistance of the structure between the terminals, which is obviously, in order to make the device operative, a gradation from the practically negligible resistance of the intact wire to the absolute break resulting after a complete combination has been affected, and the metallic strip turned into a non-conducting mass.

By no means is the mere fact that an enclosed fuse stands the explosive action of interior rupture sufficient to attest its satisfactory operation under every other condition. After the explosive effect has been subdued or eliminated, the fuse is then subjected to the entire potential of the circuit ruptured. Unless the break is then free from any conducting

quality under that particular potential a very slight leak may still be sufficient to result in a heating effect which soon causes afresh a most severe arcing, and the destruction of the entire device. It is for this reason that the condition following a short-circuit, if carried without destruction by the fuse, is sometimes not as serious a test as a gradual slow arcing break, although the instantaneous shock to the fuse is far more severe in the former case than in the latter.

Whether or not the complete enclosed fuse will stand severe short-circuit shock also depends to quite an extent on the centering of the wire rupture approximately midway between the ends of the tube, so that its resulting effect may work against sufficient filling material and fusible metal on each side.

THE OPERATION AND USE OF ENCLOSED FUSES.

The desirable time-interval function in properly constructed enclosed fuses gives to this form of fuse protective device a decided advantage, owing to the variation and adjustment of the overload time-interval which can be obtained by very simple alterations in the construction. In standard fuses of the ordinary commercial voltages the following adjustment has been adopted:

220 volts below 20 amperes will carry 25 per cent, overload for 10 to 20 seconds..

220-volts above 20 amperes will carry 25 per cent. overload for 25 to 40 seconds.

500 volts below 20 amperes will carry 25 per cent, overload for 15 to 30 seconds.

500 volts above 20 amperes will carry 25 per cent. overload for 30 to 60 seconds.

2,500 volts below 10 amperes will carry 25 per cent. overload for 10 to 20 seconds.

2,500 volts above 10 amperes will carry 25 per cent. overload for 30 to 45 seconds.

These overload time-intervals may perhaps appear small for certain classes of service, but in arranging and adopting a standard overload time for all fuses of a certain voltage, it was essential that an average time-interval be taken, and not one only adopted to some one particular class of service. Special fuses are, however, constructed with any desired time-interval.

The writer has constructed and operated fuses of the type described, ranging in capacities up to 5,000 to 10,000 volts and 30 amperes and 500 volts with 600 amperes continuous running capacity, but is prepared with data already in hand to furnish similar devices up to 1,000 amperes on 220 or 500 volts and 50 amperes on 10,000 volts. These fuses are all constructed so as to singly open circuits up to 2,500 volts.

It has frequently been suggested that for protection on high potentials a number of lower potential fuses in series might be available. Such an arrangement is, however, defective, owing to the fact that under conditions of short-circuit rush the shock may be so instantaneous that the disruption of one of these fuses may precede the other. Such condition will frequently act disastrously upon the particular fuse called upon to stand the first blow, which, until shared by another fuse, involves the opening of the total energy of the short-circuit.

On a similar basis the use of several fuses in multiple has been suggested where one fuse having the total aggregate capacity was not available. Such multiplying of comparative low resistance paths necessarily requires the greatest accuracy in adjusting the resistance of each so that division of the current may be equally shared. The impracticability of doing

this is obvious, and it is for this reason and others that this arrangement is discouraged, and every attempt made to produce a single self-contained tube, having the carrying capacity desired, and capable of working satisfactorily under all required conditions. The shunting of ordinary circuit-breaking devices by a proper enclosed fuse is an excellent arrangement and permits of most extensive application. All arcing can in this way be eliminated and breaking appliances may then be used at much higher potentials than these for which they are adapted alone.

Aside from the particular constructions noted, which are particularly applicable to fuses for electric lighting, power and similar services, the writer has developed another new type of fuse for delicate work. In this direction it has been possible to obtain accurate and safe fuses having a rating of .01 of an ampere, and which blow in 15 seconds at .02.

#### CONCLUSION.

In describing and discussing the various features of the new device of which this paper particularly treats, the writer does not intend to imply that perfection has been reached, nor that the device in its present condition is capable of meeting every possible condition of unusual service. It is, however, believed that the principles herein discussed are based on good foundations, and that similar devices constructed on these lines can be built, capable of accomplishing the results heretofore impossible with the types of fuse and other protective devices in common use. With the introduction of higher potentials in every direction, and the desire to improve the safety factor of electrical service to the utmost, it is believed that the enclosed fuse protector is essentially a necessity, and its entrance into the electrical practice of the present, is undoubtedly but the beginning of a perhaps universal application.

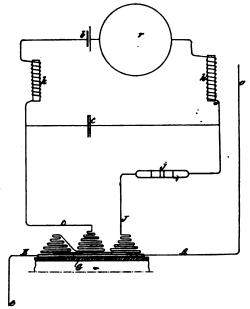
#### A Smoke-Consuming Furnace.

A German inventor, Mr. Paul Cornelius, has introduced a furnace in which the smoke produced by the burning of bituminous coal, wood, peat, or other such like fuels, is perfectly consumed, says the "Engineer and Iron Trades Advertiser," of Glasgow. In addition to this, the furnace can be made to burn inferior fuel such as culm, and generate with it intense heat. In the trials that have been made the efficiency of the furnace has been proved, and it has aroused observation and inquiry in Germany, where its use is said to have sustained the claims of the inventor. The construction and mode of action of the furnace are as follows: A forced draft is produced by a fan worked with an electric dynamo of half a horse-power. The air is slightly compressed by the fan, so that it produces strong air jets through the fire. The air is conducted from the fan to a heating chamber and from there to the fire bars. These bars are tubes closed at one end and connected at the other with a box chamber from which they receive their hot-air supply. To diffuse the air through the fire in such a way as to make active combustion proceed in every part, three rows of perforations for air jets are made along the tops of the bars and so placed that the jets of the side rows make an angle of 60 degrees with those of the middle one. The transverse section of the fire-bar tubes is, therefore, peculiar, their bottom sides being semicircular, while the top ones are hexagonal. To make the delivery of air into the fire sufficient for combustion in every part, the perforations at the front ends of the fire bars are made much smaller than those at the inward ends, as otherwise little of the air would enter the inner ends of the fire.

#### Three Marconi Patents Issued.

Three United States patents were issued on April 10 to William Marconi, the well-known wireless telegraphy expert. All these inventions have been assigned to the Wireless Telegraph & Signal Company, Limited, of London. The following is one of the principal claims of the invention:

"In a receiver for electrical oscillations, the combination of an imperfect electrical contact, a local circuit through it, an induction coil, the primary of which consists of two wires connected in parallel wound in four layers, the



MARCONI RECEIVER.

first and second layers being formed of one wire and the third and fourth of the other, the secondary of which consists of several layers, the number of turns in the outer layers being less than those next the primary and wound unsymmetrically with a lump at one end, a capacity connected to one end of the primary, a conductor connected to the other end, connections between the ends of the imperfect contact and the ends of the secondary, and a condenser in one of the latter connections."

#### A New Telephone System Tested.

In the presence of a small party of capitalists a demonstration was made last Saturday at Freeport, L. I., of what is known as the Smith-Vassar telephone system, which is now in operation there over a small circuit, with about twenty subscribers.

The advantage of this system lies in the limited number of wires required. In the system now generally in use two wires are run from the central office to each subscriber—that is, of course, where complete metallic circuits are used—so that in a section of 100 subscribers 200 wires are necessary.

By means of the new system, it is said by the inventor, forty wires at most will accommodate all the 100 subscribers, and at the same time give them more prompt and absolutely secret communication.

Fourteen of the forty wires, for instance, are devoted to a selective calling device, whereby the "central" operator can select and call any one of the 100 subscribers on her particular

section without disturbing any one of the other subscribers thereon.

The remainder of the forty wires on such a section would be used exclusively for telephoning purposes. The number of such telephoning wires may be made more or less, in accordance with the business needs of each particular section.

A subscriber wishing to establish telephonic connection with any other subscriber merely takes down his receiver from its hook. By this operation he automatically and promptly selects the first pair of the ten pairs of wires which happen at such moment to be idle, and by so selecting this pair of idle wires he secures them absolutely for his own operation, and at the same time, by this action, calls or signals the central operator, in no manner, however, interfering with the other wires.

Should nine out of ten pairs of wires be in use by the other subscribers, which would be unusual, the connection for the particular subscribers would be over the tenth, or idle, pair.

The "central" operator, seeing the signal, and learning the desired connection (say in the same section) calls, over the calling wires, the party desired, who, when he answers the call, automatically selects the next idle pair of telephoning wires, and the two are at once in absolute secret telephoning communication.

When two subscribers have finished conversation and replaced their receiving phones upon their hooks, the pair of wires which they have used become instantly idle and adapted to be instantly secured by any other party desiring to establish communication.

In this way it is asserted that the Smith-Vassar system effects a saving of from 40 to 80 per cent. in construction and maintenance over the prevailing system.

## The New York Electrical Society.

The 205th meeting of the New York Electrical Society will be held at the College of the City of New York, 23d street and Lexington avenue, on Friday, April 20, at 8 P.M. Mr. Albert B. Herrick will lecture on "Electrolysis as Caused by the Electrical Railway Ground Returns"

Mr. Herrick's lecture will include the treatment of the characteristics of corrosive action on buried metal surfaces, when acted on by electric currents flowing from them; the chemical and electrical conditions necessary for this action to take place; testing methods employed to locate these underground currents, and methods employed for the protection of sub-surface conductor systems from electrolytic action.

## Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended April 14:

York, for the week ended April 14:

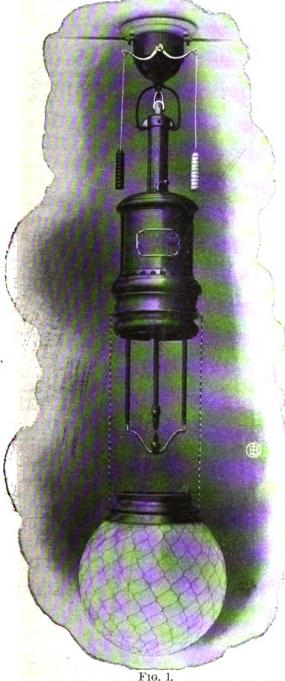
Amsterdam, 10 cases, \$125; Argentine Republic, 80 cases, \$8,066; Bristol, 27 cases, \$2,500; British East Indies, 4 cases, \$155; British Possessions in Africa, 67 cases, \$2,245; British West Indies, 30 cases, \$638; Central America, 54 cases, \$847; China, 1 case, \$15; Christiana, 4 cases, \$80; Cuba, 24 cases, \$514; Dunkirk, 92 cases, \$2,520; Glasgow; 101 cases, \$3,606; Gothenburg, 10 cases, \$4,313; Hamburg, 1 case, \$40; Havre, 222 cases, \$12,137; Havti. 2 cases, \$24; Liverpool, 133 cases, \$10,638; London, 1,952 cases, \$17,735; Manchester, 65 cases, \$4,506; Mexico, 96 cases, \$5,725; Peru, 47 cases, \$1,571; U. S. Colombia, 21 cases, \$292; Vienna, 4 cases, \$18.



## "WOOD" NEW FOCUSING SERIES ARC LAMP.

Over twenty years of experience with electric arc lamps have proven that they are the most economical means of lighting large areas, the cost per actual candle power being very much less than that of any other illuminant. As a result of this economy, and the fact that they can be so easily and cheaply installed and give such universal satisfaction, streets, parks, storehouses, railway sheds, factories, etc., are nearly always lighted by this means.

In the design of a focusing lamp Mr. Wood has maintained that in order to derive the full



benefit from having the arc always at the same point, where it gives a maximum illumination during the full life of the carbons, allowing the use of a ball globe suspended from above, which gives the very best possible diffusion, the acme of perfection would only be reached when the mechanism of any good single carbon gravity feed lamp could be employed without material change to produce this result, requiring the station manager or attendants to be familiar with and handle but one kind of mechanism for either focusing or non-focusing lamps, thereby reducing to one-half the number of

parts necessary to be kept in stock for repairs, etc. In other words, the focusing mechanism should be entirely distinct from and in no sense a part of the feeding mechanism. That the carbons should be focused and held in rigid alignment without the aid of guides, which not only cause them to stick when not of uniform diameter, but when the carbons are not consumed in the proper proportion, burn off, causing the ends to fall over, in many instances short-circuiting the lamp and sometimes destroying it. By abandoning the carbon guides, so common in other lamps, the necessity for the heavy casting close to the arc, absorbing a large percentage of the light and heat emitted from the carbons and causing a heavy shadow at one side of the lamp, reducing its effective candle power, is entirely obviated.

That such devices as counter-weights for causing the carbons to feed, imposing extra work on the feeding magnets; chains, cables and flexible connections to the carbon holders which get tangled up and broken; insulation in the frame work below the arc on which carbon dust and moisture collect, short-circuiting the lamp and causing endless annoyance, are entirely unnecessary is proven by a careful inspection of Figs. 1 and 2, which show the lamp and mechanism as they appear with the carbons consumed, ready for trimming. It will be seen that the lower frame and carbon holders are almost identical with that of an ordinary non-focusing lamp.

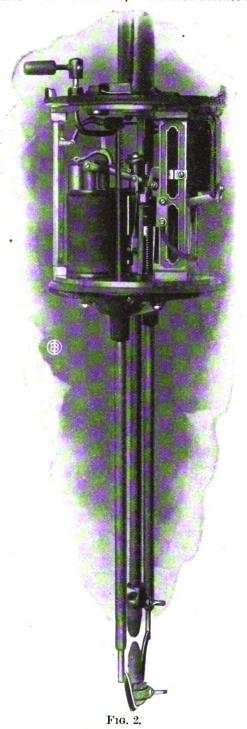
The switch for turning the lamp on and off is located conveniently at the top where it is easily manipulated, and by reference to Fig. 1 it will be seen that a portion of the case slides up out of the way while the globe is being lowered, making the carbon holders easily accessible for trimming.

The positive carbon holder is of a novel design, composed of but two pieces, yet allowing the carbons to be placed in perfect alignment and rigidly held there with the least possible difficulty.

The feeding mechanism of the lamp, clearly shown in Fig. 2, is what is known as the directacting shunt-feed type, and will feed the carbons without readjustment on any direct current series circuit from 6.5 to 9.6 amperes. In other words, the carbons are separated instantly to a full feeding arc by a small magnet of novel construction in the main circuit, which acts directly on the carbon rods without the intervention of springs or other devices. As a result of this arrangement the energy required by this magnet to perform its functions is reduced to the smallest possible extent, it absorbing but from 3 to 6.5 watts, depending on the candle-power; while the shunt or feeding magnets are so proportioned as to be capable of moving the armature through its entire range with a maximum variation of but 3 volts; and as this range includes not only the feeding point, but also the point at which the lamp cuts out, it will be seen that the lamp must always feed and cut out within 3 volts of what it is adjusted for. This armature and its retractible device are so proportioned that as it is attracted into the magnets the power required rapidly diminishes in almost the same proportion as the power of the magnet is diminished, due to the shortening of the arc; and as a consequence the feeding of the carbon is hardly perceptible with a voltmeter. The adjustment of the arc is accomplished by turning a small thumb-nut, tightening or loosening a spring which is carefully protected from mechanical injury.

The clutch for feeding the carbons is of an entirely new design, and what is known as a five point clutch. The advantages of this clutch can only be appreciated after use, as it is self-cleaning and absolutely non-stickable, while at the same time it affords extra large surfaces for wear. It is mounted in such a manner that the weight of the feed rod is always borne by the magnets, and the point at which the clutch releases can be adjusted by raising or lowering the stop with which the clutch lever comes in contact.

Another important feature noticeable in the mechanism of this lamp is the total absence of



the usual cut-out magnet, so common to most lamps. This magnet, with its windings included in both circuits, shunt and series, and its armature and contact points, has always been a source of great annoyance, principally due to the contact points corroding and sticking, causing the lamp's failure to light, or the current short-circuiting from the fine wire to the coarse wire coils, destroying both. In this lamp the cut-out mechanism is a decided departure from the old methods heretofore

in use, and is constructed with a double set of contacts, which are brought together one set in advance of the other by the combined action of the feeding and separating magnets. The first set of these contacts is faced with coin silver, enabling the lamp always to cut-out at the same voltage. They short-circuit the main or separating magnet, allowing it to drop its armature, thereby closing the second set or large contacts and cutting out the lamp. This action jars the mechanism and has a strong tendency to force the carbons together and cause the lamp to relight. As the first set of contacts cannot open until the final set is closed, the operation of this cut-out is sparkless. In addition to the foregoing there is an auxiliary cut-out which automatically short circuits the whole lamp when the carbons are consumed, thereby saving the energy absorbed in the mechanism.

This type of lamp is manufactured by the Fort Wayne Electric Works, Fort Wayne, Ind.

#### CANADIAN NOTES.

(From our Ottawa Correspondent.)

The Railway Committee of the Ontario Legislature has passed a bill fixing the rate of fare on electric railways in the province at two cents per mile.

The council for the town of Ingersoll, Ont., has decided to grant a railway franchise to the Ingersoll Radial Electric Railway Company.

Mr. W. T. Stewart, electrical engineer of Toronto, Ont., has submitted his report to the council for the town of Toronto Junction, Ont., regarding the required changes in the lighting system of the town. It is expected that some action will be taken at an early day by the council towards the installation of a new electric light plant.

#### Niagara Falls Power Development on the Canadian Side.

The agreement between the Ontario Power Company of Niagara Falls and the Commissioners of the Queen Victoria Niagara Falls Park was signed by the Canadian authorities Wednesday, April 11. This is the end of a long and bitter opposition by the American company to the rights asked for by the Ontario company.

The charter of the Ontario company was granted by the Dominion government several years ago, and the approval of the agreement by the Ontario government completes the franchise for the development of 300,000 horse power or more on the Canadian side of Niagara Falls. To the personal efforts of Banker R. Paine, of Niagara Falls, Ont., and Arthur C. Denniston, of Philadelphia, during a period of six years, is largely due the successful issue of the negotiations.

The estimated cost of the entire development of 300,000 electrical horse power is \$10,000,000. The plan is to bring water from a point where the Welland River empties into the Niagara by a canal to the bluff below the Dufferin Islands, where under a head of 45 feet the first development of 60,000 horse power will be made. Thence the water will be carried by an open canal through the park to a point just below Table Rock, where under a head of 160 feet, 240,000 horse power will be devel-

The company's plans contemplate the immediate commencement of development work. A capacity for 60,000 horse power will be the initial development at a cost of \$2,000,000. This will be increased to meet the demand up to 300,000 horse power or more. Negotiations for power are in progress with many large electrolytic industries and an immense steel plant. Locally, there is a large demand, and also a prospect of transmitting power to Toronto, Hamilton and Buffalo.

The officers of the company associated in this great enterprise are prominent citizens of Buffalo. J. J. Albright is president: Gen. Geo. S. Field is vice president, and in charge of the active management of affairs. Their associates on the directorate are: Edmund Hayes and Franklin D. Locke, Buffalo; Henry C. Symmes and Banker R. Paine, Niagara Falls, Ont.; W. M. German, M. P., Welland, Ont., and Arthur C. Denniston, Philadelphia.

#### PERSONAL MENTION.

Mr. R. C. Truax has severed his connection with M. P. Osborne at the electric light station of Camden, N. Y., and will accept the superintendency of the electric power plant at Thousand Island Park.

Mr. W. R. Benson, formerly general manager for the Easton (Pa ) Consolidated Electric Company, has accepted a similar position with the New Hope & Doylestown Electric Railway Company.

Mr. William B. Chapin of Springfield, Mass., has been appointed general manager for Hampden County of the Hampden Automatic Telephone Company.

Mr. Fred Stewart of Pontiac, Mich., who was acting superintendent of the Detroit & Northwestern Electric Railroad, died suddenly at his home a short time ago.

#### INCORPORATIONS.

The San Antonio Gas & Electric Company of San Antonio, Tex. Capital stock, \$200,000.

The Columbus Light & Power Company, Columbus, Miss. -to erect an electric light and gas plant. Capital stock, \$50,000. Incorporators: W. H. Johnson and others.

The Ulua Commercial Company, Philadelphia, Pa.- to engage in transportation, mining, constructing and electric lighting in Honduras, Central America. Capital stock, \$500,-

The Lacombe Electric Company, Denver, Col.—to erect an electric plant. Capital stock, \$1.000.000. Incorporators: C. F. Lacombe, W. S. Bagot, Z. T. Hill, F. Dorr, M. L. Stern, H J. O'Brien, all of Denver.

The Ottumwa Electric & Steam Company, Ottumwa, Ia. to construct and operate street railways, Capital stock, \$350,000. Incorporators: J. H. Merrill, J. B. Sax, J. W. Garner, all of Ottumwa.

The Hampton Roads Railway & Electric Company. Newport News, Va. Capital stock, \$500,000. Incorporators: A. H. Martin, W. J. Nelms, R. W. Shield, C. F. Day, T. W. Shelton, G. N. Wise J. P. A. Mottu, J. S. Wise; all of Newport News.

The Electrical Construction Company, Portsmouth, Va .to construct and equip for the Federal or any State Government railroads, wharves, bridges, power plants or power transmission lines. Capital stock, \$40,000, with the option of increasing it to \$100,000. Officers: President, Powell Evans: vice-president, Axel H. Engstrom; secretary and treasurer, Magnus Hellstrom.

The Agamenticus Light & Power Company, York, Me.-to construct and operate an electric light plant. Capital stock, \$50,000. Incorporators: E. S. Marshall, J. P. Bragdon, J. P. Putnam, J. C. Stewart, all of York, and F. D. Marshall of

## ELECTRICAL PATENT RECORD.

This department is edited by OSCAR A. MICHEL. Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N W., Washington, D.C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N. W , Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.

#### LETTERS PATENT ISSUED APRIL 10, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

647,030. Car-Fender. Timothy A. Remsen, New York City, assignor to Mary E. Remsen and Elizabeth Ann McGuire. Filed May 27, 1899.

- 647,079. Car. Fender. John Currie, Montreal, Can. Filed July 15, 1889.
  647,083. Car. Fender. George L. Gehrig, New York City. Filed July 21, 1899.
  647,067. Railway-Signal. John Jorgensen, San Francisco, Cal. Filed Aug. 22, 1899.
  647,142. Brake Mechanism for Electric Cars. Uldereque E. Maille. Providence, R. I. Filed Dec. 29, 1899.
  647,193. Trolley. James B. Lynch, Waverly, and George B. Griffin and John A. Simpson, Elmira, N. Y. Filed Sept. 2, 1899.
  647,299. Automatic Signal Apparatus for Railway-Crossings. George A. Vice, St. Mary's, Ontario, Can., assignor of two-thirds to William James Gilpin, same place. Filed Oct. 31, 1899.
  647,224. Indicator for Railways. Richard H. Forde, New York City. Filed June 9, 1899.
  647,454. Electromagnetic Traction Apparatus for Street-Cars, George N. Moore, New York City. Filed May 24, 1899.

#### ELECTRIC LIGHTS AND APPLIANCES.

- ELECTRIC LIGHTS AND APPLIANCES.
  647.631. Electric-Arc Lamp. Josef Rosemeyer, Lingen-onthe-Ems. Germany. Filed May 31, 1899.
  647,155. Automatic Switch for Electric Car-Lighting Apparatus. Willard F. Richards. Buffalo. N. Y., assignor to
  Charles M. Gould. New York City. Filed June 5, 1899.
  647,184. Electric Headlight, William S. Hamm. Chicago, Ill.,
  assignor to the United States Headlight Company, Buffalo, N. Y. Filed Jan. 17, 1990.
  647,219. Electric-Arc Lamp. Walter J. Cochran, Le Roy.
  N. Y., assignor to David J. Bissell, same place. Filed
  Oct. 21, 1899.
  647,434. Electric-Arc Lamp. Royal E. Ball, New York City,
  assignor to the Ball Electric Company, Yonkers, N. Y.
  Filed May 22, 1899.

#### ELECTRICAL MACHINERY AND APPARATUS.

- ELECTRICAL MACHINERY AND APPARATUS.
  647,168. Safety Appliance for Electric Circuits. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company of New York. Filed Jan. 18, 1899.
  647,210. Electromagnetic Engine. Peter B. Watson, Philadelphia, Pa. assignor of one-half to George W. Carver, Boyertown. Pa. Filed March 8, 1899.
  647,254. Contrifugal Electric Switch. Edouard Cros, Paris, France. Filed Dec 6, 1890.
  647,414. Electric Switch. Watter F. Jones, London, Eng. Filed Feb. 6, 1900.
  647,436. Au omatic Brake for Electric Motors. Mathias A. Beck, Milwaukee, Wis., assignor to Pawling & Harnischfeger, same place. Filed Jan. 9, 1899.

#### TELEPHONES AND TELEPHONE APPARATUS.

- TELEPHONES AND TELEPHONE APPARATUS.
  646,963. House Telephone System. Frank M. Dunn, Baltimore, Md. Filed Dec. 17, 1898.
  647,300. Telephone Signaling System. Newman H. Holland, Prookline, Mass., assignor to the Holtzer-Cabot Electric Company of Massachusetts. Filed Oct. 9, 1899.
  647,307. Combined Telephone Exchange and Fire-Alarm System. John M. Latimer, Philadelphia, Pa... assignor to the United Pneumatic Fire Alarm Telegraph Company of New Jersey. Filed July 3, 1899.

#### MISCELLANEOUS.

- 646,948. Press for Molding Insulators. Henry M. Brookfield and Seraphin Kribs. New York City, assignors to the Brookfield Glass Company of New York. Filed May 7, 1808

- and Seraphin Krids. New York. Act, acceptance of Brookfield Glass Company of New York. Filed May 7, 1898.

  646,949. Press for Molding Insulators or Similar Articles. Henry M. Brookfield, New York City. Filed Feb. 23, 1899.

  647,006. Special Apparatus for Electric Baths. Antonio Maggiorani, Rome, Italy. Filed Dec. 31, 1897.

  647,007. Apparatus Employed in Wireless Telegraphy. Guglielmo Marconi, London, Eng., assignor to the Wireless Telegraph & Signal Company, Limited, same place. Filed June 13, 1899.

  647,008. 647,009. Apparatus Employed in Wireless Telegraphy. Guglielmo Marconi, London, Eng., assignor to the Wireless Telegraph & Signal Company, 1 imited, same place. Original application filed June 13, 1899. Divided and this application filed Dec. 26, 1899.

  647,008. Secondary Battery. Harold S. Gladstone, London, Eng. Filed Jun. 2, 1990.

  647,101. Battery-Case for Electromedical Apparatus. James H. Mahler and Cleaveland F. Dunderdale, Chicago, Ill.; said Dunderdale assignor to said Mahler. Filed Jan. 2, 1990.

  647,147. Graphophone. Frederick Myers, New York City.

- 647, 101. Battery-Case for Electromedical Apparatus. James H. Mahler and Cleaveland F. Dunderdale, Chicago, Ill.; said Dunderdale assignor to said Mahler. Filed Jan. 3, 1900.
  647, 147. Graphophone. Frederick Myers, New York City. Filed Dec. 15, 1869.
  647, 177. Transmission of Electrical Impulses. Frederick Bedell. Ithaca. N. Y. Filed May 22, 1869.
  647, 177. Storage Battery Tams. Rufus N. Chamberlain, Depew, N. Y., assignor to Charles A. Gould, Port Chester, N. Y. Filed Aug. 19, 1869.
  647, 217. Electrolyzing Apparatus. Antoine J. O. Chalandre, Louis J. B. A. Colas and Charles J. Gerard, Paris, France. Filed March 21, 1869.
  647, 239. Elevator. Frank J. Sprague. New York City, assignor to the Sprague Electric Company of New Jersey. Original application filed July 27, 1898.
  647, 240. Electrically-Driven Mechanism. Frank J. Sprague, New York City, assignor to the Sprague Electric Company of New Jersey. Original application filed July 27, 1898.
  647, 241. Brake for Hoisting Mechanism. Frank J. Sprague, New York City, assignor to the Sprague Electric Company of New Jersey. Original application filed July 27, 1898.
  647, 242. Cable-Winding Safety Device. Frank J. Sprague, New York City, assignor to the Sprague Electric Company of New Jersey. Original application filed July 27, 1898. Divided and this application filed Sept. 20, 1899.
  647, 242. Cable-Winding Safety Device. Frank J. Sprague, New York City, assignor to the Sprague Electric Company of New Jersey. Original application filed Sept. 20, 1899.
  647, 242. Cable-Winding Safety Device. Frank J. Sprague, New York City, assignor to the Sprague Electric Company of New Jersey. Original application filed Sept. 20, 1899.
  647, 251. Storage-Battery Suspension for Motor-Vehicles. George H. Condict. New York City, assignor, by mesne assignments, to the Columbia & Electric Vehicle Company, Jersey City, N. J., and Hartford, Conn. Filed Aug. 19, 1899.
  647, 369. Elec



## GENERAL NEWS.

## What is Going On in the Electrical World.

#### LIGHTING.

Alexandria, Va.-The Alexandria Steam Laundry Company, recently incorporated, proposes to install an electric light plant to furnish light, heat and power. F. E. Anderson is president.

Arkansas City, Kan.—The electric light plant at this place, destroyed by fire a short time ago, will be rebuilt at once.

Auburn, B. I.—The people of this place are agitating the question of electric lights.

Brookings, S. D.—This city contemplates the pur-hase of a larger boiler and another dynamo for its electric lighting plant.

Buena Vista, Ga — This city will grant a franchise to any responsible concern that wishes to build an electric light plant. Address C. S. Crawford, Mayor.

Buffalo, N. Y.—At the next meeting of the penitentiary committee of the board of supervisors, Superintendent Sloan, of the penitentiary will urge the committee to take some action toward fitting up an electric lighting plant in the institution.

Burlington, Kan.—C. E. Warner, of Kansas City, is figuring on building an electric light plant here.

Charlotte, N. C.—The Piedmont Realty Company has been incorporated for \$60,000 to build an electric light plant, waterworks, etc. B. D. Heath and W. Coleman are interested.

Chicago, Ill.—An electric light plant will be installed in the Presbyterian Hospital in this city. The com-mittee is composed of Dr. W. R. Notman and Dr. W. J. McCaughan.

Creston, Ia.—The railroad company will put up and operate an electric light plant of its own here.

Devil's Lake, N. D.—The citizens of this town are agitating the electric light question.

Grant's Pass, Ore.—At a recent election it was voted to issue \$69.000 in bonds for the construction of an electric light plant and waterworks.

Greentown, Ind.—The electric light plant here was recently burned, but will soon be rebuilt.

Independence, Mo.—The citizens of this place are agitating the question of erecting an electric light plant. H. H. Pendleton, city engineer, can be addressed.

Ironton, O -The Ironton electric light plant is to be improved.

Johnstown, N. Y.—The matter of municipal ownership of the electric light plant is being agitated here. -The matter of municipal owner-

Manson, Ia.—Mr. Randolph, the new owner of the Manson electric light plant, has taken possession of same and intends to spend about \$4.000 in improving and putting the plant in first-class condition.

Madelia, Minn.-An electric light plant is prejected for this place.

Monroe, La.—The city council has appointed a spec ial committee to collect data, etc., relative to the cost of erecting a municipal electric light plant.

Plano, Tex.—The large corn shelling and electric light plant of J T. Stark & Co., was recently destroyed by fire. Loss \$10,000. The plant furnished light for the city, and will be rebuilt immediately.

Port Oram, N. J.—The Dover Electric Light Company has been awarded the contract to equip the new Ross silk mill here with an electric plant.

Redding, Cal.—F. Hurst and J. Young are interested in a company which proposes to build an electric light plant on the Pit River to develop about 6,000 hp. and to cost about \$125,000.

Shawnee, O.—The Legislature has authorized this town to issue \$25,000 in bonds for erecting an electric light plant. The question will be voted on at the light plant. spring election.

St. Michael's, Md.—The city council contemplates the erection of an electric light plant in the near

The recent election to raise the Weatherly, Pa.money to enlarge the electric light plant here resulted in favor of the plant by a majority of 138 votes.

Williamson, W. Va.—The electric light plant here is to be improved and enlarged.

#### STREET RAILWAYS.

Albany, N. Y.—A meeting of the directors of the Albany, Schoharie & Helderberg electric road will be held April 24, when it is expected that final action will be taken as to the commencement of the road.—It is reported that the officials of the Schenectady Street Reliway Company are planning the construction of an electric road between Schenectady and this city. It is claimed that the matter of routes is now under consid-

Anderson, Ind.—It is announced that the Elwood. Auderson, 11d.—It is announced that the Elwood, Anderson & Lapel Railway, which is in process of construction, will be equipped as an electric road instead of steam. The American Tin Plate Company is building the road with the view of reaching the coal fields of Clay County, Auburn, N. Y.—The Auburn Interurban electric railroad intends to construct its line to Skaneateles this summer, to be operated in connection with the city system which now has control of the suburban fran-chises.

Battle Creek, Mich.—The township board of Burlington has granted a franchise to the Southern Michigan Construction Company for an electric railway to cross the township. The proposed road will run from Battle Creek to Coldwater via Union City.

Bangor, Me.—The Penobscot Central Railroad Company has decided to equip its line with the trolley

Chattanooga, Tenn.—The Chattanooga Rapid Transit Company aunounces that an electric line is to be built up Lookout Mountain and a carriage service instituted through Chickamauga Park.

through Chickamauga Park.
Collegeville, Pa.—Efforts are about to be made by
the Trappe & Limerick Electric Street Railway Company, the control of which is vested in the Schuylkill
Valley Traction Company, of Norristown, to obtain the
right of way through the brough of Trappe and the
townships of Limerick and Lower Pottsgrove, for the
purpose of extending the trolley line from this place to
Pottstown.

Dayton, O.-W. D. Brumbaugh has been making arrangements with J. E. Feight to survey the electric road from Greenville to the Montgomery and Darke county line.

Datroit, Mich —The directors of the Datroit, U(Romeo Railroad have authorized a bond issue of -The directors of the Detroit, Utica & 000 for the immediate construction of the line. M. A. McCarron is interested.

Holland, Mich.—B. S. Hanchett has secured a frechise for his new electric road from here to Z seland.

Indianapolis, Ind.—W. S. Christian, attorney for the Indianapolis and Ft. Wayne Electric Railroad Company, authorizes the statement that the road will be built within the next six months.

Lansing, Mich.—J. T. Mills of Port Huron, and Chicago capitalis's have become interested in the proposed Lansing & Ithaca electric railway. They propose to put up \$300,000 for the construction of the road.

Noblesville, Ind.—The city council has granted the Central Traction Company of Indiana a 40 year franchise to operate an electric street car line in this city. The company agrees to erect a \$200,000 power house near the city limits.

Portland, Me.—A project is on foot in this city to build an electric railroad on Peak's Island.

Port Jervis, N. Y.—W. B. Benson is general manager of the New Hope & Doylestown Bailroad, the length of which will be 12 miles. The power house will be located at New Hope and the contractors will be Philadelphians The capitalists back of the movement are also Philadelphians. It is possible that the road will be continued to Saylorsburg, Stroudsburg, Bushkill, Milford and this place. Milford and this place.

Seymour, Ind.—The board of commissioners of Jackson County has granted a franchise to the Seymour & Southwestern Railway Company, which proposes to construct an electric line from this city southwest to Salem and on to Paoli and West Baden.

Somerset, Ky.—The citizens of Wayne and Pulaski counties have been making an effort to interest outside capital in the building of an electric line from Burnside or this place to Monticello, a distance of about 27 miles. The road would doubtless be a paying investment, as Wayne County is rich in coal, timber and oil.

Springfield, Ill.—The promoters of the proposed electric car line between this city and Sullivan have not abandoned their plaus. Nearly all the right of way has been secured, and a meeting of the men who are pushing the scheme will be held here soon and plans laid for the injection of more energy into the project.

Wilkes-Barre, Pa — The surveying for a new traction railway between Hazleton and this city was recently begun. The line will join with the Lehigh Traction Company's road, at West Hazleton, and run through Conyingham, theuce to Wilkes-Barre via Butler Valley. The length of the new road will be 27 miles. It will be built by Wilkes-Barre and Hazleton people.

### COMPANY MATTERS.

Athens, O.—The Athens Gas & Electric Company will place a new and modern equipment for its electric branch. Incandescent as well as arc lights are to be furnished.

Birmingham, Ala.—The Consolidated Electric Light Birmingham, Ala.—The Consolidated Electric Light Company is about to enlarge its plant. Within the year it will install six new engines, with a maximum combined horse power of 6.000; these engines will be built by the Birmingham Machine & Foundry Company. A new battery of boilers is also to be put in, made by the Birmingham boiler works.

Bridgeport, Conn.—Superintendent J. E. Sewell, of the Bridgeport Traction Company, says that trolley improvements will be made. Cars will be renovated at once, and next season new ones will be obtained.

Delaware, O.—The Delaware Electric Light & Power Company has been changed to the Delaware Electric Light, Power & Heating Company, and its capital stock increased from \$75,000 to \$100,000.

Lewisburg, Pa.—The Central Electric & Foundry Company's plant was recently destroyed by fire.

Los Angeles, Cal.—The Pacific Electric Railway Com-

pany has voted to issue \$200,000 in bonds to be used for improvements to its system. The company will become a part of the Los Angeles Railway Company, and several suburban extensions will be made.

Rome, N. Y.—It is stated on the authority of an official of the Trenton Falls Power Company that that company will be in a position to do business in this city about the middle of next summer, and will be ready to furnish power and light.

Washington, Pa.—The stockholders of the Washington Electric Light & Power Company have decided to increase the capital stock from \$50,000 to \$150,000.

Windsor Locks, Conn.—A plan is being discussed, which if carried out will result in the consolidation of ctric light plants of Windsor Locks, Suffield and

#### MANUFACTURING.

Baltimore, Md.—A company was recently organized here, known as the Baltimore Machine Company for the purpose of manufacturing electric elevators.

Buffalo, N. Y.—It is announced that the project of establishing a plant for the manufacture of an electric automatic switch and signal device in this city is now an assured fact. The men interested in the concern, besides the Chicago investors and promoters are said to include G. D. Morgan, Audrew Langdon, J. P. Bradfield, Charles R Huntley and others.

Cleveland, O.—The Winton Motor Carriage Com-pany has placed a contract for a large quantity of primary batteries with the Nungesser Electric Battery Company, and will use them exclusively, so it is claimed, on 1990 Winton carriages.

Trenton, N. J.—A company recently organized here, known as the Rowland Telegraph Company with a capital of \$500,000, will manufacture telegraphic instruments under paten!s.

#### POWER AND TRANSMISSION PLANTS.

Handerson, N. C.—Col. W. H. S Burgwyn, of this place, and N. D. Wilkins, have made arrangements for and establishment of a \$1,000,000 electric power plant at Pughs Falls on the Roanoke River.

at Pughs Falls on the Roanoke River.

Plainwell, Mich.—A steck company composed of New York and Chicago capitalists is p oj cting the erection of a large electric power plant here.

Santa Fe. N. M.—The machinery of the electric plant of the Cochiti Gold Mining Company at the Madrid coal mines was recently started. From this plant sufficient power and light will be trausmitted 35 miles on copper wires to drive all the machinery of the mills and the mines of the Cochiti mining district and to light the streets and houses of Bland and Albermarle.

#### MINES.

Bingham, Utah—W. H. Nutting, of the Bingham Copper & Gold Mining Company of this place, has completed designs for the new \$2 10,000 pyritic smelter to be erected here. The power plant will consist of motors with an aggregate energy of 3 10 horse power. The smoke stack will be an especial feature, a shaft 12 feet in diameter and 200 feet high.

Durango, Col.—R. J. McCartney, of Silverton, is interested in a stock company with a capital zation of \$500,000, which has been organized for the purpose of supplying electric power and light to the mines of the surrounding sections, including parts of La Plata, San Juan, Dolores and Montezuma counties.

#### AUTOMOBILES

Hartford, Coun.—The Columbia & Electric Vehic's Company of this city has found it necessary to enlarge its factory in order to keep up with the increasing demand for automobiles. The motive power at the main factory will soon be largely increase 1. At present it is derived from electricity furnished by the electric light company, and from a 100 horse power engine at the works; but a new 325 horse power engine and boiler to generate steam for it will shortly be placed in position. Nearly all the vehicles now turned out are propelled by electricity. by electricity.

Newport, R. I.—It is reported that a company has purchased property here and will have laid out a large inclosed area where novices may learn the art of manipulating the automobile under skilled teachers. Already orders have been received for more than one hundred machines of all styles, and several new vehicles will be introduced. The greater number of the automobiles have been ordered for delivery during May.

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with the instituted. The glease I humbel of the automobiles have been ordered for delivery during May.

Philadelphia, Pa—Tre Anglo-American Rapid Vehicle Company has been organized with the object of gaining control of all the automobile and traspepration companies of the country. Philadelphia capitalists are largely interested in the new enterprise, and steps are now being taken to amalginus's the various concerts in one gigantic company. W. W. Gibbs, president of the Pennsylvania Electric Vehicle Company, and who is largely interested in the Autorius Company of New York, is president of the Anglo-American Company. The company's charter was issued by the Secretary of State for Delaware at Dover, April 12. The capital stock is \$75.000.000, all of which is common stock, divided it to 750,000 shares of the par value of \$100 each. The incorporators are H. B. Twyford, of Windley, England; Ernest Martin, of New York City, and James Virden, of Dover, Del.



## THE TELEPHONE WORLD.

#### Rival For the Bell Company.

A step toward the organization of a formidable rival of the Bell system in Pennsylvania and adjoining States was taken on the 11th inst, in Harrisburg, by representatives of the larger independent telephone companies. As a result of the conference the independent telephone interests of Pennsylvania and New Jersey are so thoroughly in harmony as to be practically one corporation, except in actual operation. The chief cbject of the conference—the obtaining of a long distance service—will be accomplished without delay,

There are almost a hundred independent telephone companies in Pennsylvania, and all the important companies were represented at the conference. A. M. Worstall, of Philadelphia, secretary of the Interstate Telephone & Telegraph Company, through which corporation, working with the Telephone, Telegraph & Cable Company of America, the long distance service of the Associated Independent Companies will be secured, read a report, showing that the independent companies represent 40,000 telephones in Pennsylvania and New Jersey. Two-thirds of these companies were represented in the conference. He showed that of the sixty-seven counties in Pennsylvania, fifty-seven have independent telephone companies, and of the twenty-one counties in New Jersey eighteen bave independent service. The Interstate Company is constructing a long distance line between Norristown and Trenton, and also between Hazleton and Wilkes-Barre.

These officers were elected: President, C. W. Kline, Hazleton; vice-president, Edward Davis, Philadelphia; recording secretary, H. B. McNulty, Chambersburg; financial secretary, S. H. Browne, Pittsburg; treasurer, Ward R. Bliss, Chester.

## Important Telephone Decision.

By the recent decision of the Appellate Division in Rochester, N. Y., in the action of Wilmot Castle against the Bell Telephone Company, a precedent was established which will gravely affect private and corporate interests. The substance of the decision is that the owner of a fee abutting a highway surrenders to the public not only the right to pass along the highway, but every right in it which may be considered a reasonable street use, and that this use may be so extended in the process of time as to include many new means of passage, made necessary or advisable by the progress of civilization. "The right of free passage," says the decision, "may embrace the transmission of thought and words as a substitute for the actual physical passage of persons over a public highway," of which the court makes practical application by deciding that the purposes of a telephone company are such that it may use a public highway without infringing upon vested rights of abutting property owners.

## No Municipal Plant for This Town.

The voters of Billerica, Mass., have referred to a committee a proposition to have the town lighted by electricity. They rejected a plan to have a telephone plant under direction of town officials.

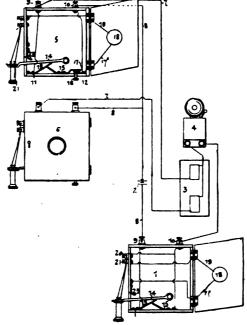
A meeting of the stockholders of the Home Telephone Company of Rome, N. Y., was held in that city recently. Robert Earl, 2d, of Herkimer, presided, and John E. Mason was secretary. These directors were elected: John S. Wardwell, F. M. Shelley, W. J. Grogan, John E. Mason, Robert Earl, 2d, James L. Brailey, Jr., and Edward L. Barber, of Wauseon, O. Messrs. Mason, Shelley and Grogan were appointed a committee to prepare papers to be executed by the stockholders to mortgage the property of the company for \$150,000. At a meeting of the directors the following officers were elected: President, Robert Earl, 2d; secretary, John E. Mason; treasurer, James S. Brailey. The president was authorized to accept in writing the franchise granted by the common council of Rome at the last meeting and to deposit \$1,500 with the chamberlain for the guarantee that the company means business. The contract for building the system was let to the Central Construction Company of Wauseon, O.

The Black River Telephone Company has established exchanges and toll stations at Boonville, Port Leyden, Lyons Falls, Greig. Glenfield, Watson, Beaches Bridge. Lowville, Turin, Houseville, Constableville, Mohawk Hill. West Leyden, Ava, West Branch, Delta, Lee Center and Rome, N. Y. The following connections will be made as soon as possible, for which all material is ready: From Rome to Taberg, to connect with Camden exchange, also other points west from Rome to Lowell, Vernon Center and others; from Rome to Orlskany, Whitesboro and Utica; from Rome to Ridge Mills, Westernville, Northwestern and to Remsen; from Boonville to Forestport, Buffalo Head, Hawkinsville, Alder Creek and Remsen; from Lowville to Crophan. Castorland to Copenhagen, Denmark, Black River and Watertown, and connect with northern independent lines.

#### A House Telephone System.

A patent was issued on April 10 to a resident of Baltimore for a house telephone system, designed to take the place of the old-fashioned speaking tube. The details of the invention may be seen by a glance at the accompanying illustration, which is described as follows:

"In a house telephone system, an annunciator system comprising a bell, an annunciator, and a battery, and electrically connected and in combination therewith, a number of telephones, each telephone having a simple contact transmitter and receiver in series with one another, each telephone except the kitchen-telephone, having a lever-hook for supporting a receiver and a contact with which the receiver



HOUSE TELEPHONE SYSTEM.

engages to close the telephone-circuit, a double-ended spring and a push-button and contact-spring, one end of said double-ended spring engaging a spring engaging the hook-lever when the receiver is supported thereby, and the other end of said double-ended lever being adjacent to the spring adjacent to the push-button, the telephone-circuit being normally open and the signal-circuit being normally open, and the telephone-circuit being closed by the removal of the receiver by the action of the springs aforesaid acting on the hook-lever, and the signal-circuit being closed by the push-button engaging its spring with the other end of the double-ended spring to operate the bell and annunciator."

#### Receiver Appointed.

The Chicago Title & Trust Company has been appointed receiver of the assets of the Western Telephone Construction Company, at 250 South Clinton street, Chicago. The appointment was made by Judge Kohlsaat in the United States Circuit Court, on petition of the Varley Duplex Magnet Company of New Jersey. In a bill filed in court the plaintiff showed that two judgments aggregating over \$5,000 had been entered in its favor against the Chicago Company, whose llabilities are said to amount to more than \$30,000. The receiver gave a bond for \$50,000 in court. The Western Telephone Construction Company was incorporated in 1893, with a capital of \$100,000, of which J. E. Keelyn is said to hold \$90,000 worth. D. A. Holmes is president of the company.

The Pennsylvania (Bell) Telephone Company is to have a rival unless it can prevent the new company from obtaining the consent of Harrisburg councils to erect its poles and wires. The new company will be known as the Harrisburg Telegraph & Telephone Company, and the charter will probably be issued by the State Department April 30. At the head of the competing company is Representative Bliss, of Delaware County, Pa. It is understood that this company will co-operate with the Southern Pennsylvania Company, which has franchises through the Cumberland Valley and other southern sections of the State.

The Brooklyn "Eagle" states that the South Shore Telephone Company operating in Freeport, L. I., has completed the work of installing its experimental line. Nearly 100 'phones have been put in on three months' free trial to test the new system, which has for an advantage the calling of central by merely lifting the receiver from the hooks, no call belis being used.

#### Fazed by Independent Fusion.

A special dispatch to the New York "Commercial," says that a leading officer of the Massachusetts corporation, representative in Boston of the Telephone, Telegraph & Cable Company, which is supposed to be one of the chief organizations opposing the Bell, said in regard to the reported combination, whereby all principal independent companies of Pennsylvania and New Jersey had joined to procure long distance service, that this appeared to be a union of the same interests allied with his company, though he knew nothing about the details. As to his idea of the attitude of the Bell companies, he stated there were evidences enough that the Bell people were seriously disturbed. He instanced a bill pending in the Legislature of Massachusetts as an example of the Bell Company's method of meeting opposition.

"That bill," he asserted, "if passed will not supervise the Bell Compeny in any way; it will supervise only us. It merely is a measure of the Bell interests intended to choke off all new companies by preventing them from getting locations. They have put the same kind of a bill through in Connecticut, and not a new company has been able to start business there since."

He was of the opinion that so far as the independent companies at large were concerned, the Bell Company would find it impossible to absorb them, for the reason that in order to do so it would have to reduce its rates to correspond with theirs. Rates once reduced, he thought, could not be raised to the old high level without such loss of business as would make an increase inexpedient.

#### Hostile to the Bell.

People who continue to use the Bell 'phones in Duluth, Minn., can get no connection with any of the public offices of the city or county except police headquarters, and that only for a few days. County officials have cut all Bell wires in the courthouse and city hall. It is estimated that 60 per cent. of the 'phones of the Bell Company have been cut off. The company is apparently taking no steps to meet the new conditions except by disassociating itself from a manager who had become unpopular by reason of carrying out its policy and by serving an injunction on the city to prevent its tearing out poles and street wires. Since the change in municipal control nobody has expected the city would take any severe steps against the company, but the order of two months ago that it vacate the streets remains on the books.

The New England Telephone Company appears to be having a hard fight on its hands in St. Albans, Vt., against an independent company which has constructed and is operating a modern system in that city with rates of \$20 per year for business places, and \$15 for residences, as against \$30 and \$24, the regular rates of the New England Company. The grocers, meat dealers, druggists, dentists and laundry men in the city, on April 1, after ordering out the instruments of the New England, disconnected them, and are only using the independent line. It is reported that the New England Company is now offering telephones in that city at \$18 per year for a business place with a free 'phone at the residence.

A certificate of the increase of the capital stock of the American Telephone & Telegraph Company of New York City from \$75,000,000 to \$100,000,000 was filed with the Secretary of Sate at Albany, N. Y., on the 11th inst. The amount of capital of the company actually paid in is \$70,975,000, and the amount of its debts and liabilities is \$24,078,431.

A copy of the proceedings for the voluntary dissolution of the Standard Telegraph & Telephone Company was filed with the Secretary of State at Albany, N. Y., on the 12th inst. The company's principal office was in Lowell, Mass., with branch offices in New York State.

#### TELEPHONE INCORPORATIONS.

The Lost Valley Telephone Company, Lost Valley, Ore. Capital stock, \$8,000. Incorporators: A. Hardie, C. W. White, J. Trizzed.

The Keystone Telephone Company, Camden, N. J. Capital stock \$2,000,000. Incorporators: N. Grey, S. S. Izard, both of Woodbury; W. H. Chew, of Camden.

The Snickersville Telephone Company, Snickersville, Va. Capital stock, \$5,000. Incorporators: E. Hawling, C. B. Turner, C. H. Osborn, A. J. Simpson, J. A. Lynch, J. B. Thomas, G. E. Plaster, Jr, H. G. Plaster, A. C. Bell all of Snickersville.

The Farmers' Telephone Exchange Company, Pipestone, Minn. Capital stock, \$100,000. Incorporators: T. F. Robinson, O. Cass, W. Frost, Mary M. Robinson, Elizabeth C. Frost, all of Pipestone,



## LECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem if a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gcn., gcneral; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mig., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

## STOCKS.

PASSE	PASSENGER RAILWAYS.						PASSENGER RAILWAYS.								
		Capital	Stock.	ĭ					Capital	Stock.					
FARE.		Bate and Date of Jast Div.	Bid.	Asked.	name.	Par	Authorz'd	Issued.	Bate and Date of Last Div.	Bid.	Anke <b>G</b>				
Albany, N Y ≺ 16 United Traction Consolidation of the Albany and	100	\$5,000,000	5 000 000	1½ % Q., Nov. '98	123	124	Hartford ConnApr 16: Hartford Street Ry. Co		\$4,000,000 1,000,000	\$200,000 247,000	3 % 8., Oct., '98.	150	=		
Troy City Railway.)						1	Holyoke Mass.—Apr 16 Holyoke Street By. Co	100	400,000	400,000	8 % A., June, '98.	2073.	212		
Allentown Pa Apr 16		4.000,000	1 500 000			15	Hoboken, N. J.—Apr 16 North Hudson Co. (N. J.) By. Co		1 250 000	1 000 000	8 <b>%</b> 1000	150			
Allentown & Lebigh Val. Trac Co Bridgeport, Conn-Apr 16:		2,000,000	1,000,000	***********	-	1.0	Indianapolis, Ind-Apr 16.	25	<b>1,250,00</b> €	1,000,000	8 <b>%</b> , 1 <b>892</b>		İ		
B idgeport Traction Co	100	2,000,000	2,000,000	1 % Aug., '98	103		**Indianapolis Street Ry		5,000,000	5,000,000		24	28		
Baltimore "Md Apr 16 a United Rail ways & Elec. Cocom.	50	24,000,000	18,000,000	••••••	163/	1634	Lancaster, Pa.—Apr 16 Pennsylvania Traction Co Lancaster & Cel. Electric By		10,000,000	9,900,000 87,500	***************************************	::	=		
Boston, Mass.—Apr 16 New England Street Ry	100 100 50	5,000,000 4,000,000 2,000,000 10,000,000 6,400,000 10,000,000	4,000,000 2,000,000 9,085,000 6,400,000	1 % Q., Jan.15, '97 6 % S., A. & O. 3½ % S., Oct., '98. 4 % S., Jan. 2, '99. 2½ % Aug. 98,	15 85 93 112	16 87 94 114 145	West End Street Reliway  Louisville, Ky.—Apr 16: Louisville Ry	100		8,500,000 2,500,000	1½ %., April '98, 2½ % S., Oct. 1, '98	€834 110	69 111		
Brooklyn N. Y Apr 16. Brooklyn City Ry	100	2,000,000	1,928,400	•••••	235 73	236	Twin City Rapid Transitcom. Twin City Rapid Transit? % pfd.	100	17,000,000 8,000,000		15/4 %, Oct., '98.	186	681% 187		
Brooklyn Rap. Transit Co., tr certf  Brooklyn Heights Railroad  dBrooklyn Oily RRguar	100	43,000,000 200,000 12,000,000 2,000,000	200,000 12,000,000	81 % Q., Jan., '99	107 207	1314 109 289	Montreal, Canada.—Apr 16 Montreal Street Ry. Co Toronto Street Ry. Co	50 100		4,000,000 6,000,000	8 % 8., <b>M. &amp;</b> N. 13⁄4 % 8., J. & J. †	2595 100	300 1001/8		
«Brooklyn, Queens Co. & Sub. RB. Coney Island & Brooklyn RB. Lings County Elevated		2,000,000 4,750,000	1,884,200 4,750,000	2 % % Nov., '98.	325	830	Memphis Tenn.—Apr 16: Memphis Street Railway Co	100	500,000	500,000	******************	25	_		
Rings County Traction Co	100	6,000,000 2,000,000	6,000,000 2,000,000	• • • • • • • • • • • • • • • • • • • •	75	80	New Haven, ConnApr 16:	25	2,000,000	2,000,000	8 % S., Sept. '98.	89	41		
gBrooklyn, B. & W. E. Railroad Buffalo N. Y.—Apr 16: Buffalo & Niagara Falis Elec. Ry	- 100	1,250,000	1,250,000		74	75	New Haven Street Railway Co New Haven & Centerville Winchester Avenue RR	100 100 25		800,000	2½ % A., July '96.	15	46		
*Buffalo Railway Co	100	6,000,000	5,870,500	1 % Q. Dec., '98.	100	103	New Orleans, LaApr 16 Canal & Claiborne RR. Co	40	240.000	240,000	4 % S., July, '98.				
Columbus Street Railroad, Columbus Street Railroad, pfd	100 100			1 % Q., Feb., '99.	15 88	25 % 84	New Orleans & Carroliton BR New Orleans Traction Co new com. New Orleans Traction Co new pfd.	1 100		•••••	1½ % Q., Oct., 98.	148 × 25	102 102		
Charleston, S. CApr 16 Charleston City Ry. Co	50 25	100,000 1,000,000		8 % 8.		::	aCrescent City BH	1 1(8)	2,000,000 500,000	2,000,000 2,000,000 185,000 1,000,000	8 % S., Jan., '99. 4 % S., Jan., '99. 1 % %., June, '94. 1 % . Oct., '98.	20%	52		
Chicago, Ill.—Apr 16 Chicago City Ry. Co	100 100 100 100 100 100 100	10,828,800 10,000,000 15,000,000 15,000,000 10,000,000 500,000 2,000,000	10,828,800 10,000,000 7,600,000 9,000,000 249,900 1,608,200 18,189,000 624,900	Feb 28 1900, 8 % Q., Jan., 99.	272 .8 27 +0% 2.5  1.0 72×	237	New York—Apr 16: Central Crosstown RR. cChristopher & 10th Sts. RR. guar. Dry Dock, E. Brdw'y & Battery RR. dMetropolitan Street Ry. Co. eBleecker St. & Fulton Fy. Ry. guar. / Broadway & Seventh Ave guar. / Gen.Park, N.&E. Rivers RR. guar. / Kleich Avenue RR.	100 100 100 100 100 100 100	650,000 1,200,000 45,000,000 900,000 2,100,000 1,800,000 750,000 800,000	600,000 650,000 1,200,000 45,000,000 2,100,000 1,800,000 748,000 800,000	2½ % Q. 2½ % Q. Oct., '98. 1½ % Q. Nov., 98. 2½ % Q. Feb., 1900 ½ % A., July, '98. 2½ % Q. 2½ % Q.	270 175 100 162 84 230 196 855 895 198	809 185 125 16234 33 285 207 400 410 105 210		
Cincinnati, Ohio.—Apr 16: Cincinnati Inc. Plane Bycom.			575.000				Second Avenue RR. Third Avenue RR.  m42d St. Manhaty'le & St Nich A-	100 100 100	2,500,000 12,000,000	600,000 1,862,000 10,000,000 2,500,000	4½ % Q.  2% Q., Jan., '99,  \$1.75 p. sh. Feb, 99.	400 159 11254 10	405 201 11284 t0		
Oincinnati Inc. Plane Rypfd. Oincinnati, Newport & Oov. St. Ry. Oincinnati Street Ry. Co	50 100 50	150,000 4,000,000 18,000,000	150.000	% % Feb., '99. 2% % Feb., 98. 1% % Q., Jan., '98. 1% % Q.,Jan., '98.	l	89	Newark N. J.—Apr 16: Consolidated Traction Co. of N. J.—	100	2,000,000 15,000,000	2,000,000 15,000,000	***********	190	200		
Cleveland, Ohio,—Apr 16 Agron, Bed. & Olev. Ricc. Ry Cleveland City Ry Cleveland Electric By	100 100 100	1,000,000	1,000,000	3/4 % Jan., '98 3-5 % Jan. '99, 3/4 % Q., Oct., '98	48 100 891/4	50 101 90	North Jersey Street Railway Co. United Electric Co. of New Jersey Pittsburg, Pa.—Apr 16: Allegheny Traction Co	100	6,000,000 504,000	6,000,000 <b>504,000</b>	11 <b>% % A</b> .	8034 28 55	8 1/4 29 4 56		
Detroit Mich Apr 16 Detroit Citisens' Street Ry	100 100	2,000,000 250,000 1,000,000	1,250,000 1,200,000 250,000 1,000,000	************	100 ½ 175 90 .:.	 ioo iio	Consolidated Traction Copfd. pCentral Traction Co qCitizens Traction Co rDuquesne Traction Co sPittsburg Traction Co [Fed ras St. & Pleasant Valley Par	50 50 50	15,000,000 1,500,000 8,000,000	15,000,000 1900,000 18.000,000	8 %, Nov. '98, 1 % % Nov. 7, '98, 6 % A.	27 65 69 10 	2734 661/2 70 71 		
Dayton O.—Awr 16 City Railway Co	100	1,500,000	1,470,600 600,000		141 170 114	145 1i5	Pgh., Allegheny & Man. Trac. Co P'tisourg & Birmingham Trac. Ry Pitisburg & West End Ry United Traction Cooom United Traction Copref	50 25 50 50	8,000,000 8,000,000 1,500,000 17,000,000 8,000,000	12,994,889 8,000,000 1,500,000 17,000 000	8 % A. 83/ %, Nov. 7, '98, 21/6 %, July, '98, 2 %, Aug., '95, 1 %, Oct. '98, 5 % A., June 20, 98, J. & J. & J. L. & J.	41 12 503/4	42% i8		

\*Unlisted. † Ex div.
a The United Railways & Electric Company comprises in its organization the Baltimore Onsolidated Railway Company, the Baltimore Onty Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U R & Elec. Co. has been issued in the form of Income bonds. b Leased to Boston Elevated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Brooklyn Rapid Transit Company; road operated by Brooklyn Rapid Transit Company; oad operated by Brooklyn Rapid Transit Company; road operated by Brooklyn His. Co., Slock owned by Kings County Traction Company; road leased to Nassau Electric RR. g Owned by Atlantic Ave RR and leased to Nassau System.
h \$30 per share on outstanding capital pa'd as rental by lessee—West Ohicago 8t. RR. Co., 2250 100 of stock owned by North Chicago Street Railroad Company.
c Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Ohicago Street Railroad Company.
f \$5 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Ballroad Company; \$625,00 of stock owned by West Ohicago Street Railroad Company; \$625,00 of stock owned by West Ohicago Street Railroad Company; \$625,00 of stock owned by West Ohicago Street Railroad Company; \$625,00 of stock owned by West Ohicago Ompany, leasee.
Classansid St. Railway purshased the Mt. A. & Eden Park road, assuming its bonds.

9 Unlisted. † Full paid. | Outstanding. ‡ Ex-div.
a Leased to New Orleans Traction Company at 6 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
h Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.
i Leased to Metropolitan Street Rallway for 18 % on stock.
j Leased to Metropolitan Street Rallway for 18 % on capital stock.
N Dividends of 1% % yearly guaranteed by Consolidated Traction Company.
o Controlled by Third Avenue Rallroad by purchase.
n Dividends of 1% % yearly guaranteed by Consolidated Traction Company.
o Control by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt' Traction.
p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
e Leased to Consolidated Traction Company for 5 % on \$3,000,000 capital stock.

\*\*Leased to Consolidated Traction Company for 6 % on apital stock.

\*\*Leased to Consolidated Traction Company for 6 % on eapital stock.

## PASSENGER RAILWAYS.

## TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Authorz'd		Bate and Date of Last Div.	Eid.	Asked	NAME.	Par	Capital Authorz'd		Bate and Date of Last Div.	Bid	. Ank
New Bedford Mass-Apr 16 Union Street Railway Co Northampton, Mass-Apr 16				2 %, Feb. 98.	160	165	Boston, Mass.—Apr 16, American Bell Telephone Co Erie Telegraph & Telephone Co New England Telephone Co	100	50,000,000	28,650,000	4% % Q., Jan., '95 1 % Q., Feb. 20, '5 81.50 p. sh. Feb '9	9. 827 99 103 9. 188	828 1033 140
Northampton Street Rv Omaha, Neb Apr 16	100			4 % A., June '98.	170	178	New YorkApr 16 American Telegraph & Cable Co					91	94
Paterson, N. JApr 16	100	5,000,000	5,000,000	3 % A. and N.	55	65	*Central & South Am. Teleg. Co  *Commercial Cable Co	100 100 100	14,000,000 6,500,000 10,000,000 1,000,000	6,500,000 10,000,000	1 × Q.	105 165 42	106 170 53
Paterson Ry. Co	100	1,250,000	1,250,000	***************************************	54		Franklin Teleg. Co2½ % guar. Erie Telegraph & Telephone Co *Gold & Stock Telg. Coguar. 6 %. *International Ocean Tel Co.guar6%	100 100	5,000,000 5,000,000	4,800,000	1% % 8. 1 % Q., Feb., '99. 1% % Q. 1% % Q.	112	118 128 11s
Inited Traction & Electric Co	100	8,000.000	8,000,000	3/4 %, Oct. '98.	109	111	Mexican Telephone Co* *New York & New Jersey Tel. Co	100 100 100	9 000 000			118 25 170	8 23/4
Philadelphia.—Apr 16 Sairmount Park Trans. Co \$50 pd. Sestonville, Man. & Fairmount	50 50	2,000,000 1,966,100	1,770,000  1,966,100	2 %, Dec. '97. 2% %, July 15, '98.	28 47	24 48	*Pacific & Atlantic Telegguar. 4 % *Postal Telegraph Cable Co *Sout'n & Atlantic Telg. Co.guar. 5 %	25 100 25	2,000,000 15,000,000 950,000	15,000,000	2½ % Q., Jan., '99 2 % S. 1 % Q. 2½ % S. 8 % S., Jan., '99.	10	100
est'nvl'e, Man. & Fairm 1 % pid. aFairmount Pk. & Had. Pass. Ry.	50 50 50	588,900 800,000 80,000,000	1588,900 800,000 29,980,450	21, %, July 15, '98. 3 % 8—July, '98. 8 % Feb. 1, '98.	75 75 333	76 76 33 <sup>3</sup> /	†Commercial Union Telegraph Co Western Union Telegraph Co †Div. guar. by Postal Teleg. Co.	25	500,000	500,000 97,870,000	8 % 8., Jan., '99. 1% %, Q, Jan. '99.	115	£ 23
nion Traction Co \$12½ pd Electric Traction Co	50 50	500,000	8,297,920 †192,500	88 share Q.	845	451	MiscellaneousApr 16:					12	
Frankford & Southwark Pas. B Lehigh Avenue Ry. Co Lombard & South Street Ry	25	1,000,000	1.000.000	\$14 sha'e A—Apr.98	90	901/2	American Dist. Teleg. (Phila.) Bell Teleph. Co. (of Canada.) Chesapeake & Potomac Telep. Co	25 100 100	400,000 8,960,000	8,561,000	1 % Q. 2 % B.	26 188 55	62
dSecond & Third Streets By People's Traction Co gGermantown Passenger By	50 50 50	1,060,000 10,000,000 1,500,000	<b>+771.076</b>	\$9 share A, Mar. 98 8 %, A., April, '98. \$5.25 share—1898. 8 % Jan., 1898.	144	145	Chicago Telephone Co	100 100	750,000	750,000		200 148 75	210 150 76
Decole's Passenger Rycom.	50 25	1,500,000	740,000	***************************************	151	152	Hudson River Telephone Co *Northwestern Telegraph Coguar	100 50	2,000,000 2,500,000	2,000,000 2,500,000	1 × Q.	120	125 125
hPeople's Passenger Rypfd. Philadelphia Traction Co Oatherine & Bainbridge St	50 50	750,000	277,402  20,000,000  400,000	\$2 p. sh., Oct. 98. 6 % A—Mar., '98. \$6 share—July, '98.	98%	963/4	Providence (R. I.) Teleph. Co Southern New Eng. Teleph. Co	50 100	-				95
Continental Pass. Ryguar. Empire Passenger Ry. Co Philadelphia City Pass. Ry	50 50 50	1,000,000 600,000 1,000,000	475,000	\$7 50 share July '98	202	208	ELECTRIC LIGHT A	\N	D ELE	EOTRI	OAL MFG	. 0	OS
Philadelphia & Gray's Fy. RR	50 50 50	1,000,000 750,000	298,650 1420,000	\$8.50 share July '98.	8.834	809	Boston, Mass.—Apr 16: Fort Wayne Electric trust receipts Ft. Wayne Elec Co. T. Sec. Series A.	25				115 85	125 50
iPnila telphia & Darby Ry.guar. 117th & 19th Sts. Pass. Ry. guar iThirteenth & 15th Sts. Pass. Ry.	50 50	1,000,000	250,000 835,000	\$2 share July, '98. 1½ % S., July, '98. \$11 sh. A., July, '58	800	::	General Electric Co. [old] com.	100 100	40,000,000 18,276,000	80,460,000 18,276,000	2 % Q., Aug., 1898. 1% % Q., Jan., 1900	13314	13 5
¡Union Passenger Ry. Co ¡West Philadelphia Pass. Rv	50 50	1,500,000 750,000	1900,000 1750,000	89.50 shre, July '98 \$10 share, July '98	255J	240	TH. Elec. CoT. Secur., Series D. Westinghouse Elec. & Mig.Co.com. Westinghouse El. & Mig. Co. pid.	50 50	4,000,000	146,700 8,996,058	13/4 % Q., Jan., '99.	45 61	16 62
ochester, N. Y.—Apr 16 ochester Railway Co	100	5,000,000	5,000,000	*****	19%	20%	Westinghouse El. & Mfg. Co. assent. New York.—Apr 16;	50	11,000,000	8,195,126		42	-
leading, PaApr 16		1,000,000	1,000,000	Semi-an.,Jan. & Jy	24	26		100 100 100			% % Oct., '98.	119	120
City Passenger Ry	50 50	850,000 1,000,000	\$50,000 \$1,000,000	Jan., '98. Jan., '98.	138 70	::	Electric Vehicle Cocom.		40,000,000	80,460,000	% Q., Aug., 1898.	82	12 98
Louis MoApr 16 outh Street & Arsenal Ry	50	800,000	150,000				Interior Conduit & Insulation Co	100 100 100	1,000,000	18,276,000 1 1,000,000 2,500,000			1835/8
derson Avenue Ry. Co	50 100	400,000 2,500,000 2,500,000	2,400,000 2,479,000	2 % Dec., 1888. 1¼ % Jan., '99. 1½ % Jan. '99.	::	::	Pittsburg, PaApr 16	100	500,000		J. & J.	168	114
Cass Avenue & Fair Grounds	100	2,500,000 2,000,000 2,000,000		4 %, Oct., '98. 2½ %, Jan., '99. 1½ % Jan., '99.	::	::	East End Electric Light Co	50	800,000	500,000 800,000	Q.		172
Sel. Louis RRseple's RR. Co	50	2,400,000 1,000,000			25	::		100 100	2,000,000 8,500,000			144	1443
nited Electric Ry 6 % pref.		500,000 1,000,000 2,500,000		8 %, Jan., '99.	80 68	23 85 10	*Electric Storage Battery Copfd.	100 10 10	5,000,000 550,000	550,000		83 18 80	90
in Francisco, Cal.—Apr.	100	4,000,000	4,000,000	8 % A., July, '95.			MiscellaneousApr 16:		187,500	187,500	***		
lifornia St. Cable RR	100 100		875,000	50c. monthly. 82.50 share, '96.	117 50 61½	119	Bridgeport (Conn.) Elec. Lt. Co Missouri-Edison (St. Louis)com. Eddy Electric Mfg. Co	25 25	500,000			47 20 10	48 21 15
esidio & Ferries RR		1,000,000	550,000	Q., 60c. per share.	**	16	Hartford (Conn.) Elec. Light Co Hartford (Conn.) Lt. & Power Co	100 25 100	850,000 175,000 100,000	:::::	24	150 6 195	10
cranton Pa —Apr 16 ranton Railway Co Scranton & Carbondale Trac. Co	50 100	6,000,000 500,000	2,500,000	••••••	29 163	80	Narragansett (Prov., R.I.) Elec. Co. Rhode Island Elec. Protec. Co	50 100	1,200,000		% Q., Oct., '98.	98	100
Scranton & Carbondale 11ac. Co Scranton & Pittston Traction Co Opingiield III.—Apr 16	100	1,050,000	1,050,000		••	••	Thomson-Houston Welding Co	100 100	1,000,000	1,085,000	% 8, Dec. 1, 96.	160 1821/8	100
ringfield Consolidated Ry	100	750,000	750,000			••	Woonsocket (R. I.) Electric Co    †On Aug. 17 last by a majority vote   to \$20,827,200, of which \$18,276,000 is ed	100 of	the stockh	olders the	e capital stock w	as red	106 uced
ringfield OApr 16	100	1,000,000	1,000,000	***************************************		11	Recently acquired the Edison Illu   pany, the Municipal Electric Light C	ımir	nating Co.	of Brookl	yn and its consti	tuent	com
ringfield, Mass.—Apr 16	100	1,200,000	1,166,700	8 <b>% A.</b>	207	212	ALLIE	D	NDUS	TRIE	s.		
oronto Canada.—Apr 16	100	6,000,000	6,000,000		100 299	10814	Boston Mass.—Apr 16. Delaware Gas Light Cocom.	50	500,000	500,000	J. & J.	72%	
ontreal Street Railway Co 7 ashington, D. C.—Apr 16		4,000,000	4,000,000	4 % 8.	299	300	Delaware Gas Light Copref.	50 50 100	10,000,000	200,000	J. & J. 2 p. sh. Jan. 26, '99	98	=
it Ry. Co	50 100 50	500,000 12,000,000 400,000	500,000 12,000,000 400,000	85c. per sh, Oct. 97.	108	107		100	***************************************	1,000,000	8.50 p.sh. Nov '98.	-	100
lumbia Ry. Co	50 50	707,000 200,000	652,000 200,000		85 15	40 16	Consolidated Electric Storage Co	100				8 150	12 155
orcester, MassApr 16	50	1,000,000		2% % Q.			Worthington Pump Copfd	100 100	5,500,000	5,500,000 2,000,000	*****		110
Vorcester Traction Cocom. Vercester Traction Co6 % pfd. Vercester & Suburban Street Ry	100 100 100	8,000,000 2,000,000 550,000	8,000,000 2,000,000 542,500	8 % S., Feb., '98.	1087	31½ 106 85	Philadelphia PaApr 16 Electro Pneumatic Trans. Co	10	1,500,000		:***	234	3½ 162
Vilkesbarre, PaApr 16.					25	29		50 100 100	10,000,000 8,500,000 500,000	2	XQ	91/2 93/4	54
* Unlisted. † Paid in. ‡ Full	oaid.	Outsta	nding. ?	Ex-div.			Welsbach Light Co	5	525,100 500,000			13%	12
a Leased to Hestonville, Man & b Consolidation Electric, Peopharges and all indebtedness of consolidations.	ple's	and Phi	ladelphia	Traction compan	nies.	Fixed	I Brhoringum Mik. Ou	100	200,000	200,000			
Fraction Company. c Practically all shares owned d Lease to Frankford & Southw	v U	nion Tract	don Comp	anv.			Miscellaneous.—Apr 16:	198	1,000,000	1,000,000	9		180
Leased to Electric Traction C	ompa	any. wark Pass	enger Rai	lway.	actio	a Co.	*Barney & Smith Oar Copfd.	100 100		1,000,000 2,500,000	1%	14 1(4 82	171/2
g Leased to People's Passenger h Majority of stock owned by I i Leased to Union Traction Con	eopl	le's Tracti v.	on Compa	any.			Johns-Pratt Co	100 100	1,250,000	1,250,000 1	% % Feb. '98	105	58 109
j Lease transferred to Union Tr	actio	on Compar	ental of	10,000 per annum	in 1	866-7-8	Pratt & Whitney Copfd Stillwell-Bierce Copfd	100			-		8 52 50
p.a. \$20,000 in 1879-1900 and \$30,000 declared as a dividend semi-annua & Dividend of 10 % guaranteed Dividend of 6 % guaranteed b Leased and operated by the S	llv.						Stillwell-Bierce Copfd. Shults Belting Co St. Charles Car Co	100	500,000		% Sept 1,'98.	50	65 90
Dividend of 6 % guaranteed b	y Re	ading Tra	ction Con	npany.			*Unlisted.		********	********	*****		-

# BONDS.

PASSENG	PASSENGER RAILWAY.						PASSENGER RAILWAY.						
	Amount.			Interest				Amo	ant.		Laterest		
NAME.	Authorised.	Issued.	Due	periods.	Bid.	Asked.	RAME.	Authorized.	Issued.	Due	periods.	Bid.	And
Albany N.Y.							New Orleans La. Date of Quotation-Apr 16, 1900.						
Date of Quotation-Apr 16, 1900							Canal & Claiborne RR cons mig. 6s. Crescent City RRlst mig. 6s.	\$150,000	\$150,000 50,000	1912 1899	M. & N. M. & N.	105%	:
he Albany Ry. Co Cons. mtg. 5s. The Albany Ry. Co Gen. mtg. 5s.	\$500,000 750,000		1947	M. & N.	*117		Orescent City RRCons. mtg. g. 5s. New Orleans City RR1st mtg. 6s.	5,000,000 416,500	8,000,000 899,000	1948 1908	J. & J. J. & D.	108	i
Vatervleit Turnpike & RR. 1st mtg. 6s. Vatervleit Turnpike & BB2d mtg. 6s.	850,000 150,000	150,000	1919	M. & N.	*128	127½ 127	N. Orleans & Carrollton RR. 2d mtg. g. 5s.	5,000,000 850,000	2,599,500 850,000	1948 1907	F. & A.	112	1
oy City Railway Co1st 5s	••••	•···	1942	******	*1161/2		St. Charles St. RR. Co1st. mtg. 6s.	800,000 800,000	800,000 75,000	1912 1906			
Interest guar, by Albany Ry. Co. Principal and interest guar, by							†\$428,500 in escrow to retire New Or- leans City RR. Co.'s 1st mtg. bonds. ‡\$90,000 outstanding.			7			
Baltimore Md.					-		New York.						
Date of Quotation- Apr 16, 1900		10 ca se			135		Date of Quotation-Apr 16 1900. Atlantic Ave. (Brooklyn)lmp. g. 5s,	1,500,000	1,500,000	1984	J. & J.	95	
nited Electric Ry. Colst mtg. g. 4s.	88,000,0 <b>0</b> 0 14,000,000	18,000,000	1949	J. & D.	102 748/4	1021/4	Allantic Av. (Brooklyn). lstgen. mtg.5s.	759,000 8,000,000	1,966,000	1981	M. & S. A. & O.	107% 115	1
altimore City Pass. Rylst mtg. g. 5s. altimore Traction Co 1st mtg. 5s.	2,000,000 1,500,000 1,250,000	1,500,000	1929		1187/8	120	Broadway & 7th Ave. 1st cons. mtg. g. 5s. Broadway & 7th Ave 1st mtg. 5s.	1,500,000	7,650,000 1,500,000 500,000	1904	J. & D.	128	1
altimore Trac. Co. Exten. & Imp. g. 6s, al. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000 750,000	1,750,000	1901 1942 1900		104% 121 101	121%	Broadway & 7th Ave2d mtg. 5s. Broadway Surface1st mtg. 5s. Broadway Surface1st mtg. 5s.	500,000 1,125,000 1,000,000		1924	******	108 115 105	1
al. Trac. Co. Coll. Trust, 1st mtg. g. 5s. altimore Traction Co. Convertible 5s. entral Pass. Ry. Co1st mtg. 6s	800,000 96,000	*********	1906 1912	N. & M.	1021/2		Broadway Surface	6,000,000	6,000,000	1941	J. & J.	116 115	1
entral Pass. Ry. CoCons. mtg. g. 5s. lty & Suburban Rylst mtg. g. 5s.	601,000 8,000,000	580,000		M. & N. J. & D.	119	121 117	Brooklyn, Bath & W.E. RR.Gen.mtg.5s. Brooklyn Heights RR1st.mtg.5s.	1,000,000	448,000	1983	J. & J.	101	
ake Roland Elev.,lst mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117		Brooklyn, Q's Co. & Sub'nlst mtg 5s.	8,500,000 4,500,000	250,000 8,500,000 2,750,000	1941	M. & N.	112	:
All of the bonds of the above mpanies, marked t, have been as-							Bleecker St. & Fult'n Fer'v RR. 1st mtg 7s	7,000.000	5,181,000 700.000	1900		109%	"
m'd by the United Railways & Elec-							Central Crosstown RR	250,000	1,200,000 250,000 800,000	1922	M. & N.	107 125 101	
Boston, Mass.  Date of Quotation- Apr 16, 1900.							Coney Island & Brooklyn RR. 1st mtg.5s 2D. Dock, E. Bd'y & Bat'y R. gen.mtg.g.5s Dry Dock, E. Bd'y & Bat'y RRscrip 5 %.	1,000,000	980,000 1,100,000	1932	J. & D. F. & A.	117	
ynn & Boston RRlst mtg. g. bs. est End Street RyDeben. g. 5s.	5,879,000 8,000,000	8,702,000 8,000,000	11902	M.A.N.	114	115 106	42d St., Man. & St. Nich. Av. 1st mtg. 68.	,200,000	1,000,000	1914 1910	M. & S.	108	1
est End Street RyDeben. g. 41/s. 21.674.000 in escrow to retire outstand-	2,000,000	2,000,000	1914	M. & S.	112		12d St., Man. & St. N. Av 2d mtg. inc. 6s. Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	1,500,000 5,000,000		1998	M. & S.	82 124	1
charleston S. C.							Second Avenue Ry. Gen. cons. mtg. 5s	1,600,000 800,000	1,600,000 1,600,000 800,000	1997 1909	M. & N.	120 120 1°8%	
Bate of Quotation - Apr 16, 1900.							Second Avenue Ry Deb. 5s. Steinway Ry. (L. I.) 1st mtg. g. 6s. South Ferry RR. Co 1st mtg. 5s.	1,500,000 850,000	1,500,000	1922	J. & J.	116	
nterprise Street RR	500,000 850,000	47,000		J. & J. J. & J.	106	::::	Twenty-third Street Rylst mtg. 68.	5,000,000	5,000,000	1987 1909	J. & J. J. & J.		1.
Controlled by Charleston St. Ry .Co.				4			Union (Huckleberry) Rylst mtg. 5s.	2,000,000	150,000 2,000,000	1942	F. & A	106 118	
Chicago III.  Date of Quotation—Apr 16, 1900							#\$1,085,000 in escrow to retire gen. mtg. 5s. bonds.	500,000	500,000	1948	J. & J.	110	
hicago City Rylst mtg. 4%s. hicago Passenger Rylst mtg. 6s.	5,000,000 400,000			J. & J. F. & A.	1013/4	102	1\$4,850,000 in escrow to retire maturing obligations.						
hicago Passenger RyCons. mtg. 6s. hicago & So. Side R. T1st mtg. g. 5s.	1,000,000 7,500,000	600,000	1929 1929	J. & D.			¶8552,000 in escrow to retire 1st and 2d mtg. bonds.				+	1	
icago & So. Side R. T	1,500,000 4,040,000	750,000 4,040,000	1907 1982	J. & J. J. & J.	1081/2	109	In treasury, \$80,000. ‡‡ Guar. by Union By. Co.		2.			0 1	
ke Street Elevated RRlst mtg. g. 5s. strop. W. Side Elev. Rylst mtg. g. 5s. rth Chicago St. RRlst mtg. 5s.	7,574,000 15,000,000	8,781,200 15,000,000	1928 1942	J. & J. F. & A.	96	96%	Toronto Canada.  Date of Quotation- Apr 16, 1900.					111	
rth Chicago St. RR Vert. indeb. 68.	8,171,000 500,000 500,000	8,171,000 500,000 500,000	1911	J. & J.	106		Montreal St. Rylst mte Ag	2,500,000	800,000	1908 1921	M. & S. M & S.		-
rth Chicago City Rylst mtg. 6s. rth Chicago City Ryconsol. 4%s. est Chicago St. RRlst mtg. 5s.	2,500,000 4,100,000	2,500,000 8,969,000	1927	J. & J. M. & N. M. & N.	108	111	†Toronto St. Bylst mig. g. 4½s. †885,000 per m. single track authorized.	4,550,000	2,200,000		- G.		١.
et Chicago St. RR Deben, 68	2,700,000 12,500,000	700,000	1911	J. & D.	101 1065/8	102 107	\$600,000 in escrow to retire 6s due in 1901. Philadelphia.						
est Chicago St. RR Con. mtg. g. 5s.  7. Chicago St. RR. Tunnel lst mtg. 5s.  Redeemable at option on 80 da. notice.	1,500,000	1,500,000	1909	F. & A.	••••		Date of Quotation-Apr 16, 1900			1000			
Funded debt assumed by Chicago W. v. Ry. Co., controlling interest of tich is owned by W. Chicago St. RR.							Continental Pass. Bylst. mtg. 6s Empire Pass. Bylst mtg. 7s	850,000 800,000	810,000 200,000	1300	J. & J. J. & J.	****	:
lich is owned by W. Chicago St. R.R. L., lessee. Subject to call after Oct. 1, 1899, at							Greene & Coates St. Ry	100,000 150,000 250,000	100,000	1901 1905	J. & J. J. & J.		
0 and interest. Assumed by W. Chi. RR. Co., lessee.							People's Pass. Ry2d mtg. 5s	500,000 1,125,000	250,000 458,000 867,000	1911 1912	J. & J. M. & S.	::::	:
Int. guar. by W. Unicago St. ER. Co.					7		People's Pass. RyStk. trs. cert. g. 4s.	5,698,210 200,000	200,000	1910	J & .		:
Cincinnati, O.  Date of Quotation—Apr 16, 1900			2				Philadelphia Trac. CoColl. tr. g. 4s. Thirteenth & 15th St. Rylst mtg. 7s.	1,800,000	1,018,000	1917 1908 1911	F. & A		:
n. New. & Cov.St. Ry. 1st Con.mtg. g.5s it. Adams & Eden P'k In1st mtg. 6s.	8,000,000 46,000	2,500,000	1922	J. & J. A. & O.	118 1/4 108 1/4	1141%	Union Passenger Ry		500,000 29,724,876	1945 1905	A. & O. A. & O.		:
14. Adams & Eden P'k Inlst mtg. 6s.	100,000 581,090	100.000	1905	A. & O. M. & S.	1083/4		West Phila. Pass. By1s. tg. g. 6s. West. Phila. Pass. By2d mtg. 5s.	250,000 750,000	246,000 750,000	1906 1926	A. & O. M. & N.		1:
Oov. & Oin. St. Ry2d mtg. 6s.	250,000 400,000	250,000	1912	M. & S. J. & J.	121 1/2 1823/4	122½ 187	? The trust certificates were issued to pay for the shares of the Electric and		100,000				-
Assumed by the Cincin. St. Ry. Co. \$250,000 reserved to retire 1st mtg. bds.					1		People's Traction lines purchased.  Pittsburg, Pa.						
Cleveland, O.							Date of Quotation-Apr 19 1900						
Date of Quotation—Apr 16 1900 rooklyn Street RR. Co1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½ 118½	107	Birmingham, Knox & Allentown6s. Central Traction Co1st mtg. 5s.	500,000 875,000	500,060 875,000	1930	M. & S. J. &. J	1093	:
veland City Cable Rylst. mtg. 5s.	8,000,000 2,000,000	2,500,000	1922 1909	J. & J. J. & J.	118½ 105½ 106	114 % 106 107	Citizens' Traction Co	1,250,000 1,500,000	1,250,000 1,500,000	1927 1980 1918	A. & O. J. & J.		:
eveland Electric Ry.Co. 1st mtg. g. 5s. lumbus (O.) Cent. Ry1st mtg. g. 5s.	8,500,000 1,500,000	1,249,000	1918	M. & N.	106	107%	Millyale, Eina & Sharnghurg	50,000 1,250,000 750,000	50,000 1,250,000 750,000	1942	J. & J. J. & J. M. & N.	110	
ast Cleveland RRlst mtg. 5s. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s. rain (O.) Street Rylst mtg. 6s.	1,000,000 600,000 200,000	1,000,000	1922	M. & N. J. & J.			Pittsburg, Cratton & Mansneld58.	250,000 750,000	250,000 750,000	1924 1927	J. & J. A. & O.	******	
Ry. Co., Grand Rapidslst mtg. 5s. 11,900,000 in escrow to retire bonds of	600,000	600,000	1912	J. & D.			Pittsburg & BirminghamIst mtg. 58.	1,500,000 500,000	1,500,000 500,000	1929 1922	M. & N. J. & J.	108%	10
iorbed companies, marked a. Interest guar, by Cons. St. Ry. Co.		1					*Pg'h., Allegh, & ManchGen. mtg. 5s Second Ave. Traction Co5s Sub. Rapid Transit Railway Co6s	1,500,000 2,500,000	1,400,000 2,000,000	1980	A. & O. J. & D. V. & S.		:
Detroit, Mich. Date of Quotation—Apr 16 1100.							Providence R. I.	500,000	500,000	1.811	T . 65 B.		
etroit Citisens' St. Ryist mtg. 5s. Wayne & Belle Isle Rylst mtg. 6s.	7,000,000	8,885,000	1905	A. & O. A. & O.		1021/4	Date of Quotation - Apr 16 1900						
e Detroit Ry	1,800,000	1,800,000	1902	J.&D.	105	1063/2	Newport Street RyCoupon 5: United Trac. & Elec. Colst mtg. g. 5:	50,000 9,000,000	50,000	1910	J. & D.		
i. Oity Ry. and Grand River St. Ry.							St. Louis.	2,000,000	8,260,000	1988	M. & S.	116	1
New Haven Conn.							Date of Quotation-Apr 16, 1900						
w Haven St. Ry1st mtg. g. 5s. w Haven (Edgewood Div.)1st.mtg.5s	600,000 250,000	600,000 250,000	1914	J & D	111 111		Baden & St. Louis RRlst mtg. 5s. Cass Ave. & Fair Gds Rvlst mtg. 5s.	5000 000 1,600,000	250,000 1,600,000	1918	J&J J&J	100	1
inchester Avenue RR-1st mtg. g. 5s	100,000	MOO 000	1012	MAN	109		Citizens' Railway Colst mtg. 5s. Comp. Hts. Un. De. & Mer. Terlst	2,000,000	1,500,000	1007	J&J	109	

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PASSENGER RAILWAY.												
	Ame	unt.										
NAME.	Authorised.	Issued.	Due	Interest periods.	Bid.	Asked.						
St. Louis.	1	l	<u> </u>	1	<u> </u>	<u> </u>						
Date of Quotation - Apr 16, 1100,												
Jefferson Avenue Bylst mtg. 5s. Lindell By. Colst mtg. 5s	400,000 1,500,000	400,000 1,500.000		M. & N. F. & A.	108 108	105 109						
Missouri RR. Co	1,000,000 400,000	700,000 800,000	1916 1910	M. & S.	105 100	106 102						
People's RB. Colst mig. 6s. [People's RB. Co2d mig. 7s.	125,000 75,000	125,000 75.000	1902 1902	J. & D.								
People's RR. CoCons. mig. 6s. St. Louis & E. St. L. Electric. 1st mig. 6s.	1,000,000 75,000	800,300 75,000	1904 1905	J. & J.	100	101						
St. Louis RR. Colst mtg. 5s. 4St. Louis & Sub. Bylst mtg. g. 5s.	2,000,000 2,000,000	2,000,000 1,400,000	1900 1921	M. & N.	99 1/6 108	100 % 104						
St. Louis & Sub. ByIncome 5s. ††Southern Electric ByCons. mtg. 6s.	800,000 500,000	800,000 500,000	1909	M. & N.	80 106	84 108						
Taylor Avenue St. Rylst mtg. g. 6s. Union Depot BR. Colst cons. mtg. 6s.	500,000 1,091,000	500,000 1,091,000	1918 1900	J. & J. A. & O.	116 100	118 100%						
Union Depot BB. CoCons. mtg. 6s. †Controlled by St. Louis BB. Co.	8,500,000	1,787,000	1918	J. & J.	121	122						
Controlled by Union Depot BB. Co.												
\$200,000 in escrow to retire 1st & 2d												
mtg. \$500,000 in escrow.   \$200,000 in escrow to retire 1st mtg.												
San Francisco Cal.												
Date of Quotation—Apr., 1900. California St. Cable BBlst mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117						
†Ferries & Cliff House Bylst mtg. 6s. Geary St., Park & Ocean BRlst. mtg. 5s.	650,000 1,000,000	650,000 671,000	1914 1921	M. & S. A. & O.		117 95						
Market St. Cable By. Colst mtg. g. 6s. †Metropolitan By. Colst mtg.	8,000,000 200,000	8,000,000	1918	J. & J.	126%							
Omnibus Cable Colst mtg. 6s. Park & Cliff House BBlst mtg. 6s.	2,000,000 850,000	2,000,000 850,000	1918 1912	A. & O. J. & J.	126 % 105 %	107						
Park & Ocean BB	250,000 700,000	250 000 700,000	1914 1912	J. & J.	115	125						
Sutter St. By. Co	1,000,000	900,000	1918	M. & N.	••••	•••••						
Washington D.C.												
Date of Quotation—Apr 16, 1900  Belt Ry. Co	500,000	450,000	1920	J. & J. A. & O.		••••						
Eckington & Soldiers' Home. '~' mtg. 6s.	500,000 200,000	200,000	1911	J. & D.	182	•••••						
Metropolitan BB. CoColl. tr. cons. 6s. †\$50,000 in escrow to retire 1st mtg.bds.	500,000	500,000	1901	J. & J.	•••••	•••••						
Miscellaneous.  Date of Quotation—Apr 16, 1900.												
Bridgeport Traction Colst mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110						
Buffalo (N. Y.) By. CoCons. mtg. 5s. t('tizens' St. B. (Ind'polis).lst cons. m.5s	5,000,000 4,000,000	8,548,000 8,000,000	1933	F. & A. M. & N.	118 104	105						
Orosstown St. Ry. (Buffalo)lst. mtg.5s. Columbus (O.) St. Ry1st cons. g. 5s. Consolidated Traction (N. J.)lst mtg.5s	8,000,000 8,000,000	2,866,000 2,261,000	1932	M. & N. J. & J.	112 115	118						
Crosst'n St. Ry. (Colu's, O.)lst mtg.g.5s Denver City Cable Rylst mtg. g. 6s.	15,000,000 2,000,000	18,965,000 572,000	1938	J. & D. J. & D.	1111/4	111% 115%						
Denver Con. Tram'y CoCon. m. g. 5s.	4,000,000	8,800,000 922,000	1938	J. & J. A. & O.	20 80	85						
Minneapolis St. Rylst cons. mtg. g. 5s †No. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	6,000,000 5,000,000	4,981,000 4,050,000 2,878,000	1919	J. & J. J. & J.	119 110¼	119¼ 110¾						
No. Hudson Co. Ry. (N.J.)2d mtg. 5s. No. Hudson Co. Ry. (N. J.)Deb. 6s.	8,000,000 550,000	550,000 489,000	1928	J. & J. M. & N.	108	•••••						
Paterson (N. J.) ByOons. mtg. g. 6s. tochester (N. Y.) Bylst mtg. 5s.	500,000 1,250,000 8,000,000	1,000,000 2,000,000	1981	F. & A. J. & D.	••••	•••••						
St. Paul City RyOons. g. 5s. St. Paul City RyDeb. g. 6s.	5,500,000 1,000,000	4,298,000 1,000,000	1987	A. & O.	105%	106						
†\$1,000,000 in escrow to retire 1st and	1,000,000	2,000,000		•••••	108	••••						
d mtg. bds. 1\$800,000 in treasury. Bonds guar. by												
Buffalo By. Co. 48760,000 in escrow to retire bonds of												
. C. St. BR. Co. 1887,000 in treasury.				•								
\$2960,000 res'ved to redeem prior liens.												
ELECTRIC LIQUE AND	5 51 5	07016			*With							
ELEOTRIO LIGHT AND	) ELE	OTRIC		. Mr.	<i>3.</i> 0	08,						
Boston, Mass.  Date of Quotation—Apr 16, 1900.												
Delaware Gas Lt. Co.,	800,000 <b>2,02</b> 5,000	800,000		J. & J. Quar.	106 157	•••••						
General Electric Cogold coup, deb. 5e Pittsburg Pa	10,000,000	8,750,000	1922	********	116	*****						
Date of Quotation-Apr 16, 1900												
Allegheny County Light Co6s. Westinghouse Elec. & Mig. Co. Scrip 6s.	500,000 195,570	•••••	1911	J. & J. M. & S.	110	*****						
Miscellaneous(Apr 16, 1900.)	4 010 000	4 910 000	1010		100							
E itson El. Ilig. Co. (N. York) 1st m. 5s E itson El. Ilig. Co. (N. Y.) con. m. g. 5s. E itson Elea Ilig. Co. (Brooklyn)	4,812,000 15,000,000 5,000,000		1910 1998 1940	•••••	109 124 1271⁄4	124						
E lison Elec. Illg. Co. (Brooklyn) E lison Electric Light (Philadelphia) Kings Co. El. Lt. & Pow. Co.lst mtg. 5s.	2,000,000 2,500,000	2,500,000	1937	A. & O.	100	103						
Kings Co. El. Lt. & Po. Co.pur. money 6s Milwaukee El. Ry & Lt. Co.1st con. g. 5s.	5,176,000 8,000,000		1997	A & O. F. & A.	120 102) <sub>%</sub>	122						
United Elec. Light & Power Oo(N. Y.)	5,000,000		••••			••••						
TELEPHONE	AND	TELEG	iR	APH.								
Miscellaneous.  Pate of Quotation—Apr 16, 1900,		l			1001/4	101						
American Bell Telephone			1908	F. & A.	10079	• • • • • • • • • • • • • • • • • • • •						
N.Y. & N.J. Telep & Tele Co. gen.mtg.5s Chesapeake & Potomac Teleph. Co5s.	••••••	*****	1911	J. & D.	114	115 106						
ALLIED		STRIE										
Miscellaneous.	1		<del>].</del>									
Date of Quotation-Apr 16, 1100												
American Electric Heating7s. Armington & Sime Engine Co	500,000	5 10.030				25						
Barney & Smith Car Co	75.000	********	1942 1904	J. & J. J & D.	106	107						
Worthing on Jump Co Nomina	75,000 1,		******		115	120						

## NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 17@17½c.; Lake, 17½@17½c.; casting, 16&@17&c.

A gross increase of \$19,914 is reported by the United Power and Transportation Company for March.

The Elison Electric Illuminating Company of Brooklyn has filed a certificate of merger of the Bergen Beach Light and Power Company.

The American Telephone and Telegraph Company will make application to the New York Stock Exchange in a few days to list its new stock.

The Senate at Washington has passed the Hale bill providing for a cable from San Francisco to Honoluiu, and eventually to the Philippines.

It is rumored that the Consolidated Traction Company of New Jersey has purchased the Camden, Gloucester & Woodbury Electric Railway.

A dispatch from Irwin, Pa., s'ates that the Greensburg, Jeannette & Pittsburg Traction Line will be sold under foreclosure of a \$500,000 mortgage at Greensburg May 1.

Kuhn, Loeb & Company of this city announce that the subscription list for the Western Union Telegraph Company  $4\frac{1}{4}$  per cent. bonds has been closed, the amount being largely over subscribed.

Stockholders of the New England Telephone & Telegraph Company will hold their annual meeting May 7, and also a special meeting to consider the increase in capital stock from \$15,000,000 to \$20,000,000.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat,  $26\frac{1}{4}$ ,  $27\frac{1}{2}$ ; New York Electric Vehicle Transportation,  $11\frac{1}{4}$ (2)? New Englan 1 Transportation,  $5\frac{1}{4}$ (2), Telephone & Telegraph Company of America 4(2); Gramophone, 44(2)4.

The United Electric Light and Power Company of Baltimore. Md., has declared the regular annual dividend of  $2\frac{1}{2}$  per cent. on its preferred stock, payable May 1 to stock of record April 25. The company reports for the six months ending April 30 a surplus of \$56,641.

The Philadelphia Electric Company in the last two or three months has steadily shown increased earnings over last year, and the company is now earning at the rate of 35 cents to 40 cents per annum on the stock. The company is stated to have in the treasury around \$1,250,000 in cash.

Statements that have been made to the effect that the New England Electric Vehicle & Transportation Company will be absorbed by the Electric Vehicle & Transit Company, which will operate a line of automobiles in Fifth avenue, New York, are eironeous. The New York company has no interest in the New England concern.

The Grand Electric Company of Bergen County, N. J., which supplies electric light and power to Hackensack and neighboring towns, reports for the nine months of its existence to February 28: Gross earnings, \$134,399; expenses, \$17,892; net and other income, \$65,262; interest charges, \$46,240; surplus for stock, \$19,022, equal to over 8½ per cent.

The Whitney-Widener-Elkins syndicate has bought up the American Air Power Company, in which Richard Croker is a large stockholder, and has obtained control of the Compressed Air Company of Hinnois, in which Joseph Leiter is heavily interested. This means that the Metropolitan Street Railway Company of New York will control nearly all the important compressed air patents in the country.

Messrs. Widener and Elkins, of Philadelphia, are attending to the details of the plan to merge all of the street railway systems of Pittsburg into the new Union Traction Company. It is claimed by a stockholder of the United Traction that they have devised a scheme to throw down the legal barriers raised by Messrs. Whitney and Stephenson, bankers, of Pittsburg, and that by June 1 the new Union Traction Company will be in full operation.

The Boston "News Bureau" is authority for the statement that the New Eug-

The Boston "News Bureau" is authority for the statement that the New England Street Railway Company has sold a controlling interest in the Winchester Avenue Street Railway Company of New Haven, Conn., to I. A. Kelsey, representing the Bridgeport Traction syndicate. It is claimed that Mr. Kelsey purchases a controlling interest at \$48 per share, and minority stockholders may secure an injunction to prevent the transfer, claiming the stock was worth more than this price.

A director of the United Traction Company of Philadelphia is reported as saying: "I do not believe that a divided don Traction stock will be paid before the latter part of this year. Earnings are steadily increasing, but during the coming year considerable new work will have to be done and the rolling stock increased." One in a position to know what the Union Traction Company is doing rays that the surplus of the company for the year ending June 30 should be below \$1,000,000.

The directors of the Metropolitan Street Railway Company of New York have formally approved the proposition to lease the Third Avenue road. The Metropolitat Company agrees to pay to the stockholders of the Third Avenue Railroad Company during the next four years in the form of dividends whatever earnings there are after the fixed charges, taxes and operating expenses have been deducted. The two succeeding years it will pay 5 per cent. on the capital stock of the Third Avenue, the following four years 6 per cent. and after ten years 7 per cent.

Avenue, the following four years 6 per cent. and after ten years 7 per cent.

The Capital Traction Company of Washington recently placed on record a deed of trust to the National Safe Daposit, Savings and Trust Company to secure the payment of 3,000 bonds of \$5,00 each, payable April 1, 1920, with interest at 4 per cent. per annum, payable semi-annually, with the right to redeem on and after April 1, 19.3. The purpose of the issue issaid to be to retire a former issue of 5 per cent. bonds, amounting to \$1,000,00, to liquidate existing flusting indebtedness amounting to about \$80,000 and to provide a fund from which the cost of reconstruction of the U street extension, the construction of the loops and the purchase of new cars may be paid.

of new cars may be paid.

At a meeting of the directors of the Chicago Union Traction Company Saturday afternoon the officers of the company were empowered to sign the agreement with the Chicago Consolidated Traction Company for the consolidation of their roads. This is the culmination of a series of negotiations between the Yerkes system of sulturban surface lines and the Chicago Union Traction Company, by which the latter secures control of 207 miles of electric railway on the north and west sides of Chicago. W. L. Eikins of Philadelphia resigned as a member of the Union Traction directors and the vacancy was filled by the election of General Manager J. M. Reach of Chicago. The proposition submitted to a vote of the Consolidated Traction shareholders was one under which the stock holders were asked in December to deposit their stock with the Illinois Trust and Savings Bank in accordance with the agreement by which the stock was to be transferred to the Chicago Union Traction Company in exchange for 4½ per cent. bonds, on the basis of a valuation of \$15 a share for Consolidated Traction stock. It is understood that the bonds will be in the nature of a collateral trust issue, the interest on which will be guaranteed by the Union Traction Company. The time for the deposit of stock expired on December 31, and it is said that about \$13,000,000 of the \$15,000,000 was turned in by shareholders.

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# FLECTRICITY

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THE TRADE SUPPLIED BY
THE AMERICAN NEWS COMPANY.

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## EDITORIAL NOTES.

The
Electric Automobile
Successful in a
Severe Test.

Ever since the automobile was first brought out a discussion has been going on as to what form of motive power was

best adapted to the propulsion of this type of vehicle. In France the mineral spirit motor driven carriage is the most popular, presumably owing to the fact that this form of power was the first to give the desired results, namely, lightness, combined with what would be termed in a horse endurance. In this country the steam propelled automobile has during the past year become quite popular for the same reasons. Electricity as an automobile motive power has been looked upon rather unfavorably, owing to the fact that it has taken longest to develop and apply to this particular service, the storage battery problem having proven the chief stumbling block. As a result automobile enthusiasts have looked upon the electrically propelled automobile as having but a limited field of usefulness, and consider that it should be confined to towns or large cities, where a day's run would not exceed say twenty miles and where there exists facilities for recharging the batteries.

In view of the above sentiments the result of an automobile contest, which took place recently on Long Island, will probably come as a surprise to some of the advocates of gasoline and steam. This race, which was referred to briefly in last weeks' issue of ELECTRICITY, was over a fifty mile course, the prize being a handsome silver trophy presented by a member of the Automobile Club of France. In all there were nine entries, one electrically propelled machine, five gasoline machines and three vehicles driven by steam. The electric automobile, which was driven by one of our leading automobile manufacturers, easily outspeeded gasoline and steam and covered the half century in 2 hours, 3 minutes and 30 seconds, or some fourteen minutes faster than any of the other vehicles.

It is the general belief that an electric automobile must necessarily be heavy and unwieldy, but strange as it may seem the winning of this contest is in part attributed to the fact that the electric vehicle being of light construction was better able to make its way against the strong head wind that was blowing than any of its competitors.

Although this contest does not necessarily prove the superiority of electrically driven vehicles over those propelled by other motive powers, it does go to show that it is by no means impossible to construct an electric vehicle capable of traveling a distance of fifty miles at a high rate of speed without it being necessary to sacrifice the essential quality, lightness. It also gives weight to the prediction recently made by Mr. A. L. Riker before the New York Electrical Society that "inside of six months a light, electric vehicle will be produced, not exceeding 1,000 pounds in weight, that will be capable of carrying two passengers fifty miles on one charge."

\* \* ;

The Pacific Cable.

The near future should see much activity the world over in the submarine cable laying line. Germany, France

and Russia are all discussing the advisability of laying cables to various points, while only recently the U. S. Senate at Washington passed the Hale bill authorizing the laying of a cable to connect San Francisco with Honolulu, Hawaiian Islands.

As stated in the issue of ELECTRICITY of January 3, 1900, a number of bills have been before Congress looking to the construction of a submarine cable, to connect this country with its new possessions in the Far East, and incidentally to establish communication with Japan and China. The bill that has just been passed by the Senate might be termed the Navy bill. It provides for a cable only to Honolulu, but declares a purpose to extend it in the future. The first section reads as follows:

"That to the end of establishing hereafter telegraph communication between the United States and the Philippine Islands and Japan, under the waters of the Pacific Ocean, there shall be constructed, under the supervision of the Secretary of the Navy, a submarine telegraphic cable or cables and connecting land lines from the city of San Francisco, Cal., to the city of Honolulu, H. I., over such route as may be deemed by the Secretary of the Navy to be the most practicable."

The bill carries with it an appropriation of \$3,000,000, and the Committee on Naval Affairs, which reported favorably on the bill the latter part of March, believes that the line can be built for this amount. Plaps are to be prepared by the Secretary of the Navy, and naval vessels will be made use of as much as pos-

sible in making surveys, and carrying on the work. A provision in the bill requires that "the cables, wires and other instruments, materials and appurtenances necessary in the work of laying the cable shall be of American manufacture, provided that they can be procured at a cost not exceeding 12 per cent. above what it could be procured for in foreign markets."

When completed the operation and control of this cable is to be transferred to the Postmaster General, who will have authority to receive and transmit messages in the interest of commerce and the public.

The clause in the bill requiring that the cables and other apparatus be of American manufacture is an exceedingly good one, even though it may cost the Government slightly more than were the materials purchased abroad, as well as occasion some delay in the carrying out of the work. At present, as is well known, this country is but poorly prepared to supply large quantities of submarine cable, but the erection of plants for the manufacture of this line of material are contemplated, and if given sufficient encouragement by the Government, there is no reason why the United States should not in time rival England in this line of industry.

That a cable to Honolulu will prove of commercial value to this country there is little doubt, but it is to be hoped that before this first link in the chain to the Far East is completed arrangements will have been made for extending it on to the Philippine Islands.

\* \* \*

The
United States
Leads the World
in Copper
Production.

The Bureau of Statistics of the Treasury Department has received a copy of a German publication covering the use of copper during the century just

drawing to a close, and the wonderful part the United States has taken in its consumption. During the past decade the United States has produced more than one-half of the total copper production of the entire world, and this is a remarkable evidence of our industrial growth, when it is noted that in the decade preceding this we only supplied about one-third of the total output, and in the decade of 1871–80 only about one-sixth of that amount.

The growth of the copper production during the century has been very rapid, the first ten years showing only 91,000 tons; the fifth, 291,000 tons, and in the decade just ending, 3,643,000 tons, of which 1,963,000 tons are supplied by North America, and it is claimed that the larger portion of that amount is the output of mines in the United States.

The greatly increased demand for this material is further illustrated by the fact that although the production has increased from 505,909 tons in the decade 1851-60 to 3.643,000 in the decade 1891-90, the average price, according to the publication from which this report is made up, has only fallen from \$539.50 to \$252,75 per ton; the production having increased by six-fold, while the price has decreased only about one-half.

While the production from all parts of the world has increased with startling rapidity during the century, that of North America has by far outgrown all other parts of the world, and it is apparently through the enormous supplies of North America—chiefly those of

the United States—that the world's production has so greatly increased.

A table contained in the publication named gives the production of each decade by principal countries, and shows no record of production in the United States earlier than the decade 1841-50, in which period the total production is placed at 2,400 tons, while in 1851-60 it was 37,000 tons; in 1861-70, 97,000 tons; 1871-80, 186,000 tons; in 1881-90, 730,000 tons, and in 1890 1900, 1,963,000 tons; the copper production of North America in the decade 1891-90 being thus two and one-half times as great as in the preceding decade and ten times as large as in the decade 1871-80.

In the matter of consumption the figures are equally interesting. A table is given showing the consumption of England, France, Germany and North America, in which it appears that the consumption of the four countries named in 1899 was 409,583 tons, against 268,447 tons in 1893, being an increase of about 50 per cent. during the period under consideration; while in North America alone the production is given at 77,433 tons in 1893 and 162,000 tons in 1899, the growth being over 100 per cent. during the period named.

The rapid increase in the share of the world's copper consumption made by the United States is illustrated by the export figures for the decade just ended, which show that the exportation of copper in ingots, bars and plates, which in 1890 amounted to 20,237,409 pounds, had increased in 1899 to 254,987,164 pounds, while the total value of the copper exported, exclusive of ore, increased from \$2,349,392 in 1890 to \$35,983,529 in 1899.

### UNDER THE SEARCHLIGHT.

#### Notes and Comments on Various Topics.

The eighth annual report of the General Electric Company has just made its appearance. It shows that the sales during the last fiscal year, ended January 31, amounted to \$22,379,463, which, added to royalties, dividends and interest, brings the total amount taken in to \$24,406,068. The cost of goods was \$16,436,935, and general expenses \$2,490,002, leaving a net profit of \$5,479,131. A still further reduction of \$2,000,000 has been made in the valuation of patents, franchises, etc., leaving the patent rights, etc., standing at \$2,000,000. The report in full will appear in the next issue of Electricity.

PRESIDENT C. J. GLIDDEN, of the Erie Telephone system, is reported to have made the statement that inside of five years the telephone, telegraph and cable business of the country would be consolidated under one management, employing a capital of \$250,000,000.

As the French public complained of the poor telephone service the Minister of Posts and Telegraphs has begun the experiment of replacing the girls by men at one of the principal "centrals" of Paris. His newspaper statement announcing the change confesses that all beseeching and disciplinary measures have been powerless to prevent the girls from chattering among themselves instead of devoting their sole attention to connecting subscribers. Men are expected to be more reasonable.

WORK is rapidly progressing on the aerial railway between Barmen and Elberfeld in Germany. This railway, which was described in

the issue of Electricity of November 30, 1898, will be about eight miles in length, and follows the course of the river Wupper—not Kupper as several papers have it. This road is unique, the cars being suspended at a considerable height by means of a structure somewhat resembling that of the elevated roads in New York City. The cars, which have a seating capacity of fifty, are provided with two 36 hp. motors, which will permit of an average speed of about twenty miles an hour. The work on the system is more than half completed, and it is thought that the road will be ready for operation about March 1, 1901.

Among the bills signed by Governor Roosevelt since the New York Legislature adjourned was that of Mr. Beddell, permitting any surface railroad to abandon any portion of its route which it may deem no longer necessary for the successful operation of its road and the convenience of the public.

An electric railway, to be 409 miles long and to cost \$14,000,000, is to be constructed, with the approbation of the Government to the extent of \$6,000,000, connecting the States of Tobasco, Yucatan, Chiapas and Campeche, Mexico.

WORK has been commenced on the construction of the new power transmission line to run along the mountain from the Cataract Power Company's station at the De Cew Falls to the city of Hamilton, Ont. The work will be finished, it is expected, and the line ready for operation on July 1.

THE Automobile Club of England started on its 1,000 mile run on Monday last. The course is from London to Edinburgh and back. Seventy-five vehicles started. The run was planned to demonstrate the capability and intelligence that has been reached in the management of this type of conveyance.

THE Paris Exposition is now brilliantly illuminated at night. There are 3,115 incandescent lamps at the great gate entrance, in addition to 12 large arc lights. On the cupola and minarets there are eight searchlights and 16 simple reflector lights upon the pylons.

THE General Electric Company has placed E. F. Kirkpatrick, a Pittsburg man, in charge of the Chicago office of the Siemens & Halske Works.

The members of the Fourth District of Dental Surgery held their thirty-second convention recently at the Hotel Edison, Schenectady, N. Y. A feature of special interest was an address by Mr. Martin P. Rice of the General Electric Company on "The X-Ray and its Uses in General and Dental Surgery" (also showing apparatus in use). The lecture was delivered in a darkened room and illustrated with apparatus furnished by the General Electric Company.

ONE of the most important of the many developments of electricity now going on in Canada is that for the production of calcium carbide on the Saguenay River, near Chicoutimi, Que. On February 5th last Mr. T. L. Wilson of St. Catherines, Ont., the inventor of the process of producing calcium carbide, bought from the Quebec Government the Saguenay



power at tidewater, which is capable of a development of 69 feet head and will give over 200,000 horse-power. At this point the Ship-Shaw River falls into the Saguenay, and has quite a flow of water, giving at its minimum about 15,000 horse-power under a development of 138 feet over the water wheels, the total fall being over 150 feet. Here Mr. Wilson proposes first to develop 10,000 electrical horse-power on the Ship-Shaw, and a second development of 100,000 horse-power on the Saguenay, leaving a further possible power development on the Saguenay of another 100,000 horse-power. The development of 10,000 horse-power on the Ship-Shaw River is now proceeding. There will therefore be an immense quantity of electric power available for renting to other industries, and being on tidewater the location would afford a most advantageous situation for manufacturing industries, particularly that of woodpulp and paper mills, it being the center of the finest pulp wood district in the world.

ACCORDING to Prcf. Borchers, the eminent electro-metallurgist, the world-manufacture of calcium carbide is utilizing a power equal to 180,000 hp.; that of the alkalies and the combinations of chlorine, 56,000 hp.; of aluminum, 27,000 hp.; of copper, 11,000 hp.; of carborundum, 2,600 hp.; of gold, 455 hp.

THE City of Mexico is ordering about all the machinery and equipment material for an extensive system of electric street railroads in the United States.

In a few days the officials of the Delaware and Raritan Canal will make a test of a new electrical canal boat propelling device. The machine works somewhat similar to a trolley, and is expected to pull much heavier loads and at much higher speed than can be done by the present method. Superintendent Henry W. Dunn, of Trenton, it is said, will conduct the test

An automobile exhibition will be held in Vienna, Austria, under the auspices of the Austrian Automobile Club from May 31 to June 10. The exhibits will include automobiles of every description, as well as kindred appliances. Foreign goods to be exhibited will be admitted free of duty, and returned free of charge after the closing of the show.

TWENTY electric illuminated signs for Wichita, Kan., have been ordered from the Hunter Electric Sign Company of Cincinnati. These signs will be used on the open cars which will run during the summer months. The signs consist of a box which contains a lamp and a roll on which are printed, in transparent letters, the names of the different lines. The signs are provided with a handle which extends through the roof of the vestibule so the motorman can place any of the names to the front.

MANY prominent railroad men have been watching the competitive tests of elevated railroad electrical equipments over the new third-rail system in the Boston Subway. The tests are designed to prove the best and most improved system, and the one which shows superior qualifications is to be accepted for the new Boston elevated road, fast nearing completion. They comprised the running of trains at high speed equipped by three different electrical methods.

THE Commercial Cable Company has given notice that the International Telegraph Bureau announced that the Eastern Extension, Australasian and China Telegraphs have signed an arrangement with Southern Australia, Western Australia and Tasmania for reduced rates to these three colonies, to go into effect on May 1.

The Staten Island Rapid Transit Railroad Company has purchased from the Pennsylvania Railroad the engine which broke the record between Washington and Elberon, N. J., at the time it pulled the train carrying President James A. Garfield after he was assasinated in the Baltimore & Ohio depot at Washington. The engine is now known as No. 20, and will do service on the Amboy division.

News from West Chester, Pa., states that an electric clock, which will ring the bells according to the Normal School programme, is shortly to be placed in the office of that institution, to take the place of one which has been in use about nine years. The new clock will be more than four feet in height, and will be a model of usefulness. Inside it will be a pilot clock, by means of which other timepieces, in various parts of the school plant, may be run when connected by electric wires.

MR. E. PIERARD, a telegraph engineer of Belgium, has had an opportunity of studying this last winter the effect of snow on the telephone wires near Malines. He found, says the London "Electrical Engineer," that a bronze wire 2 mm. in diameter collected an ovoid of snow, whose two axes were respectively 28 mm, and 36 mm. The weight of the snow was, roughly, 1.78 times that of the wire. A smaller wire 1.4 mm, in diameter collected an envelope of snow 4.38 times its own weight. The result of this snow collecting on the wires running from the central office in Brussels imposed an extra weight of over 30 tons on the supports. In calculating the deflections produced by the heavy coats of snow, the author found that in many cases the long spans were safer than short ones. This was because the long spans sagged sufficiently to enable the central portions to find additional supports on house ridges, etc. As an example of what these sags would be with the weights mentioned above, the author found that with a span of 100 yards there was a sag of four yards, with a span of 550 yards the sag was about 25 yards.

At the Zoological Garden in Cincinnati, O., an ostrich has been suffering from paralysis. He has been placed in a derrick-like sling improvised by Superintendent Stephens with hopes of saving the bird. While he is suspended in air, hung up by the neck, electric shocks are administered. Three shocks have been given, and it is now believed he will recover.

Some interesting experiments upon the corrosion of metals in sea water have been made during the last two years at Kiel. The method followed was to cut in two twelve samples of the metals to be tested, nine of which were then submerged in the sea water while the other three were held to serve for purposes of comparison. At the end of eight months three of the specimens immersed were taken out of the water and compared with those that had been retained outside. At the end of sixteen months three more were taken out, and at the end of twenty-four months the three last. These samples were composed of alloys of copper rich

in zinc, of bronzes with a small proportion of zinc, of bronze free from zinc, of pure aluminum bronze and of aluminum bronze containing some zinc or zinc and iron. The last showed an especial resistance to corrosion, not having been attacked at all in the two years of immersion. The alloys containing zinc gave the least satisfactory results. The alloys of copper and tin and of copper and aluminum, and the bronzes containing iron resisted corrosion perfectly, although they were in contact with iron in the water. The bronzes containing iron placed in the sea water in contact with the bronzes containing tin showed a more or less notable attack. An important point for the prevention of corrosion is to avoid placing these alloys in contact with metals that are electropositive in relation to them.

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A PHYSICIAN of Toronto, Can., has designed a self-propelled automobile wheel chair for invalids. It carries a four-horse-power motor and sufficient battery capacity for a 15-mile run at a rate of four and a half miles an hour.

The Paterson Parchment Paper Works has recently completed the erection of a large electrical filtering plant at its works in Passaic. N. J. A large amount of water is used in the making of paper. This water is pumped from the Passaic River. It is first sent through large tanks over coils charged with electricity. The water, be it ever so black, after a trip through the tanks, is clear as crystal. The new machinery installed removes the stench from the water, which the old system failed to do

MR. WU TING FANG, the Chinese Minister, who will go to St. Petersburg in the early summer as the diplomatic representative of his country, will leave the United States in a blaze of glory. His departure will be delayed until after the automobile meet to be held at. Washington, D. C. He is a devotee of the horseless carriage and is making great preparations for the coming meeting. He is having built in this city a gorgeous automobile. It will be of the phaeton type. The body will be painted a brilliant oriental yellow and the velvet upholstering will be of the same hue. It will seat four persons. Mr. Wu is surprised that a yellow vehicle could arouse so much interest. "Yellow," he says, "is a very quiet color in oriental countries, and with white is considered as a half mourning combination."

#### Proposals Invited.

The Bureau of Supplies and Accounts of the Navy Department is inviting sealed proposals until May 1 for furnishing the League Island, Pa., navy yard with a quantity of electric fans and blowers. Specifications and blank proposals will be furnished intending bidders upon application to the navy pay office at Philadelphia, Pa., or to the Bureau at Washington, D. C.

Sealed proposals are being invited until May 3 for furnishing the District of Columbia with telephone supplies during the coming fiscal year. Specifications and other information will be furnished upon application to the Board of Commissioners, Washington, D. C.

The Interior Department is inviting sealed proposals until May 3 for furnishing the Government Hospital for the Insane at Washington, D. C., with 3,000 incandescent electric lights, of 16 cp., 110 volts. Blank forms of proposals will be furnished upon application.

#### ELECTRIC MINING MACHINERY.

#### BY FRANK C. PERKINS.

During the past few years there has been great advancement in the utilization of electricity in mining operations. The plants installed for the use of electricity in mines at the present time represent a vast investment of capital and include in many cases water wheels and turbines, but most frequently boilers, engines,

in propelling the machine to points desired. When the truck is in use all the moving parts except the main spur gear are disconnected.

In equipping a mine with coal cutting machinery it is not necessary to make any special preparations inside the mine other than the stringing of the wire. The machine mounted on its truck is brought into the room where the cutting is to be done and delivered to the face of the coal, the truck running on the



FIG. 1.—SELF-PROPELLING MACHINE WORKING IN 34" OF COAL.

dynamos, wiring, switchboard apparatus, electric undercutting machines, electric drills, electric mining locomotives, electric pumps, fans, and other machinery utilized in this line of work. While the reader has frequently had opportunities to study the general construction of the machines now on the market, it may be of interest to see from the accompanying illustrations the methods of operation and means employed in fastening the machines in place in mines where the space at hand is limited. Every effort is made to make the machines as compact as possible, as will be noted in illustrations, Figs. 1 and 2. An electric chain coal mining machine on a self-propelling truck is seen in the first illustration as it is being moved about inside a mine, while Fig. 2 shows a machine in position to begin cutting.

The electric coal cutting machines are made up of the following distinct parts-the outside frame, the inside or cutting frame, the carriage and the electric motor which supplies the power. Ironclad multipolar motors are generally used, the field being of cast steel. The carriage is made of cast steel with motor supports made solid with the body. The carriage also contains the main driving shaft bearing. The outside or bed frame consists of two steel channel bars and two steel angle bars securely fastened together by means of heavy steel braces. A heavy steel casting joins the channel bars and forms a guide for the inside frame. The inside or cutting frame consists of a forged steel center rail, a cutter head and two steel guides in which the cutter chain runs.

A self-propelling truck is frequently used in connection with coal cutting machines to facilitate the movement of the cumbersome mechanism from point to point about the mine. The chain machine is so mounted on the truck that its moving parts may be disconnected and the power from the electric motor can be used

wooden rails used for mine cars. The rear end of the truck is lifted, the machine easily slides off, reaching at once its proper position to begin cutting (Fig. 2). Connection is made to the feeders, the current is turned on and the maDistrict of West Virginia. The cable is connected to the motor and reel terminals, and by means of the starting switch lever the machine is put in operation. A cut is made 6 feet deep by 44 inches wide in about 3½ minutes and one minute is required to withdraw the machine. The jacks are then loosened and the machine is moved over for another cut. The operation is then repeated until the entire width of the room is undercut 6 feet deep.

Two men are required to operate a machine, a machine runner and a helper. These two men may be seen in Figs. 1 and 2. The duty of the runner is to see that the machine is kept in good condition, set rear jack and start machine, while the duty of the helper is to see that the front jack is properly set, attend to bits and shovel back the cuttings. When the machine is started it continues to advance until the full depth of cut is made, when it is automatically thrown out of feed and is ready to reverse and withdraw from cut.

Another type of cutter which is used to operate in a minimum space is what is generally known as the single rail machine The cutters which disintegrate the coal are inserted in a large wheel. The undercut can be made 3, 4, or 5 feet. One such type is the Longwall machine. The height is only 18 inches and the width without wheel 3 feet 9 inches, while the length over all is 8 feet 2 inches. The feed on these machines is 25, 16 or 8 inches per minute as desired, and can be varied while the machine is in operation. In order to follow the variations in the floor of the mine, the wheel swings on a bearing in such a way that it is adjustable in a horizontal plane. The electric motor on this machine is also a multipolar type and may be operated in a mine using circuits of either 220 volts or 500 volts potential.

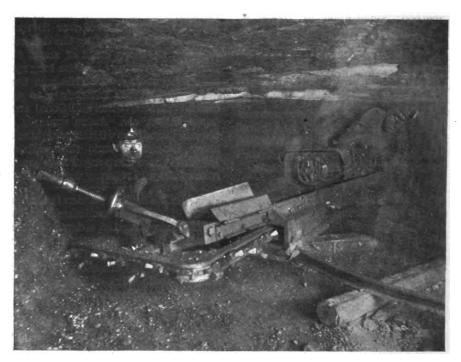


Fig. 2.—Electric Chain Coal Cutting Machine Ready to Begin Cutting.

chine is ready to cut. In a room 24 feet wide, which is the average, the machine would be placed in position at the left hand rib, the front jack being securely screwed to the face of the coal and the rear jack to the roof. Fig. 3 illustrates a 500 volt electric chain machine in position to cut. This was taken in a very thick vein of coal, as will be seen. This picture was taken in a mine in the Pocahontas

The next and last type of machine is known as the electric shearing machine. This machine is used to make a vertical cut in the coal. It is built to undercut six or seven feet deep and can be used in any thickness of vein, making the cut from top to the bottom. This machine is mounted on a truck and has an electric motor similar in construction to those above mentioned.

When shearing a room or entry with machines it is necessary to raise the machine to the top of the vein. The best results are obtained by making the first cut at the top and then letting the machine down far enough to make another cut. To provide for the secure and rigid support of the machine two columns are used at a point representing the balancing position, to which the frame is clamped tightly to hold it in place when cutting. The front end of the machine is steadled by two auxiliary columns, the four columns varying in length according to the thickness of the vein in which the machine is working. In general it is possible with such a machine to cut from

illuminating body e (Fig. 3) is connected in a manner which will be described later on, to two metal wires fastened to the pointed metal pieces g g. These are forced into the slotted metal tubes d d (Fig. 2), and the complete holder is then screwed or otherwise fastened on to the globe, which also contains openings for the introduction of the light which heats the pencil. This lamp very readily admits of the interchanging of the pencils and cleaning the globe. Fig. 4 illustrates a similar lamp for obliquely-placed lamp-holders, u being a small spring attached to the contact piece c and ensuring constant connection with the center of it. Slight modifications of the above

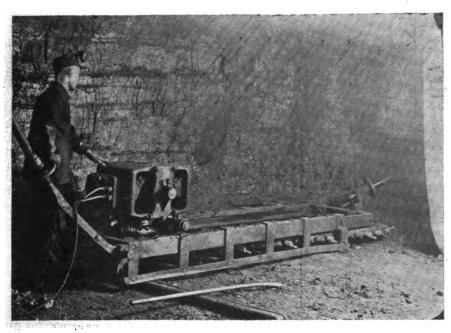


Fig. 3.—500 Volt Electric Chain Machine Working in a Very Thick Vein of Coal.

50 to 100 feet of entry per day of ten hours. A single cut is 36 inches high, five feet, six feet or seven feet in depth and about four inches wide.

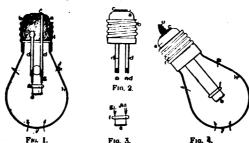
Electric power drills have not been extensively used in mines, but are now being more generally introduced.

## RECENT DEVELOPMENTS IN NERNST LAMPS.\*

Although the fundamental mechanism of the Nernst lamp has now been patented for some years, and largely capitalized companies have been formed for the purpose of exploiting these patents both in this country and abroad, yet the only instance of its commercial employment so far has been in Göttingen, and that quite recently. Engineers, however, have not been idle, and in the meantime we gather that much time and energy, and also money, have been expended in developing and improving this lamp. Judging from the Patent Office files, these attempts have not been directed at merely evading Nernst's fundamental patent, but rather at devising improvements in the lamp itself which would render it more convenient to use.

The first patent to which we desire to draw attention (No. 6,024, 1899) was taken out on behalf of the Allgemeine Electricitäts-Gesellschaft, and describes a form of lamp which can be fitted to an ordinary Edison or Swan lampholder. The special features of this type of lamp are clearly indicated in Figs. 1, 2, 3. The

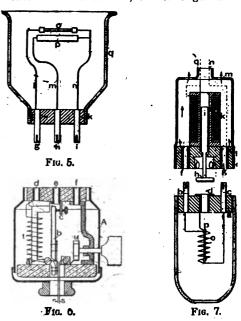
holder are described for adaptation to a Swan lamp. The simple form of the type of lamp just described has the advantage of cheapness, but on the other hand, the necessity for holding a light to it for some little time renders its employment somewhat inconvenient, and must react against its exclusive or even extensive use. This difficulty has been ingeniously met and, we suppose, overcome in the lamps described in patents Nos. 6,025, 6,026 (1899), also taken out by the Allgemeine Company. The



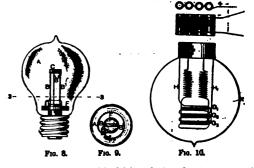
principle made use of is in every case to pass the current simultaneously through an auxiliary heating coil in close proximity to the illuminating pencil and the parallel circuit containing the pencil itself. At first, when the pencil is cold and its resistance is extremely high, nearly all the current will pass through the auxiliary coil. This becomes heated, and in turn raises the temperature of the pencil, which rapidly increases in conducting power, taking an increasing portion of the current. The auxiliary circuit is completed through a steel contact key situated near to the iron core of an electromagnet placed in series with the illuminating circuit; and when finally the cur-

rent passing through this circuit is sufficiently strong, the core will attract the steel hammer of the contact key and break the auxiliary circuit.

Figs. 5 and 6 illustrate the lamp and holder respectively of a lamp of this kind. The two circuits are here plainly discernible. The first passes from r through the iron piece b, making contact with the screw c, and through e and k



to the auxiliary heater p, and back through the parts marked n, i, f, u to the other leading wire s. The second circuit starts also from r and passes round the coil t of the electromagnet, and thence through t to the illuminating pencil s, and back as before. When the temperature of the pencil has been raised sufficiently to make it a good conductor, the current passing through the electromagnet will cause the core to attract the iron piece s and break the auxiliary circuit. Fig. 7 illustrates another lamp of the same kind. In this case the auxiliary heating circuit may be traced from s



through the metal bobbin of the electromagnet, which at its lower extremity rests on the contact tube d, and from this through the heating coil o and back along the dotted line to n. The pencil p, in this case inside the heating coil, is electrically connected to the coil of the electromagnet k, to which g is also connected. When this circuit takes a sufficient amount of current, the iron core i will be drawn up into the coil, and the auxiliary circuit will thus be broken. A slight modification of the construction of this lamp readily adapts it for the case of bayonet contacts instead of the sliding contacts illustrated in the figure.

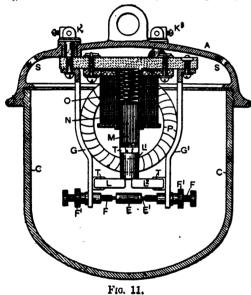
The same object is attained in a slightly different manner in the case of a lamp patented by the British Thomson-Houston Company (patent No. 5,941, 1899) and illustrated in Figs. 8 and 9. In this case the pencil is surrounded by a heating coil, c, of high resistance, and an

<sup>•</sup> From the "Electrician," London.

arrangement is provided whereby the current in this circuit is automatically broken when the pencil d takes a sufficient amount of current. Porcelain, clay or magnesia are some of the substances mentioned in the specification for the illuminating pencils. It is particularly claimed for this type of lamp that it is specially suited for high-voltage circuits and also for alternating currents of low frequency. Fig. 9 is a section taken through 3, 3, (Fig. 8). An entirely different kind of lamp has been designed by Prof. Fessenden. In this the mechanism permits of coating the pencil with a thin layer of carbon or graphite sufficient to conduct the current in the first instance, and finally to be burned away when the pencil is working properly. This coating of graphite must be re-applied on every occasion on which the lamp is to be lighted.

The lamp shown in Fig. 10 is specially designed to hold a reserve of several pencils, each of which comes automatically into use when the lower one has burned out. The method of arranging these pencils is shown in the side view.

A lamp of somewhat different type was patented by the British Thomson-Houston Company (No. 13,404, 1899) and is represented in Fig. 11. Here the auxiliary heating is per-



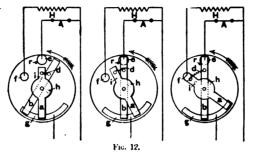
formed by striking an arc in close proximity to the pencil, the flame of which heats it. When this conducts sufficiently well, a solenoid in series with it draws the carbon pencil up and the auxiliary circuit is thus broken.

Mr. Hirst, of the General Electric Company, has patented (No. 24,264, 1898) also a switching device for use with Nernst lamps of the independent heating circuit type. This is illustrated in Fig. 12, which is self-explanatory. The first figure represents both circuits open; the second the heating circuits closed. In use the heating circuit switch is held for an instant, during which time the filament will have become sufficiently heated to conduct, and is then allowed to fly back by means of the spring arrangement shown.

The great difficulty in connection with all types of Nernst lamps, and which must in the first instance be satisfactorily overcome, is that the materials of which the pencils are made conduct like electrolytes, in so far as their resistance diminishes with increasing temperature. There exists therefore considerable danger that the illuminating pencil will be burned out. Much ingenuity has been expended in discovering a material which would properly compensate for this effect by a corre-

sponding increase in its resistance under the same circumstances. In the Allgemeine patent specification (No. 6,027, 1899) no materials are specifically referred to as being employed, but it is intended to apply broadly to all materials having a high temperature coefficient. This compensating-resistance is to be placed near to the pencil, and to be subjected to a slight preliminary heating in order to bring it more nearly in correspondence to its resistance when the final current passes through it.

Another important difficulty lies in the method of connecting the non-conducting pencil to the metal wires connecting it to the



external circuit. Patents have been taken out by the Allgemeine Company for the following soldering mixtures, which are said to be suited for this purpose:

	Thorium, %.	Zirconium, %.	Yttrium, %.	Cerium,%
1 2 3 4 5 6	93.7 80.0 95.0 70.0 70.0 80.0	3  10 	3 20 5 20 30 19.5	0.3    0.5

In addition to these, Messrs. Siemens & Halske have patented a method (18,489, 1899), in which by the repeated heating of the pencil to incandescence, and dipping into certain powders or pastes of the following metalloids-boron, silicon and their oxygen-free compounds—the end becomes soft and admits of the conducting wire being pushed into it. The metals, manganese, molybdenum, chromium, titanium, nickel, the platinum group of metals, and the oxygen-free compounds of these metals, such as the sulphides, phosphides, nitrides and carbides, are referred to as being suited for the same purpose.

#### USE AND CARE OF ELECTRIC METERS.\*

#### BY E. D. KELLY.

Ten or twelve years ago electric energy was invariably supplied at a fixed rate per month for each installation, without much regard for the amount actually furnished, and while no one could claim that the system was advantageous, either to the plant furnishing the current or the customer, still while there was no accurate recording meter suitable for general installation, its continuance was a necessary evil, as proof of its being an evil, 90 per cent. of the plants lost money. In small cities where electric lighting was introduced it was looked upon as an enterprise that must be supported. Some patronized it for the novelty, and others as an object of charity. In all cases they would turn on all lights, and burn them as long as current was furnished. If you had 3,000 lights wired in, you should have 4,000 light capacity; but thanks be to the recording

meter; without it many of us would have been bald-headed, busted or in some other line of business.

Put your plant on strictly a meter basis, and you are perfectly safe with 30 per cent. overload wired in—in fact, I know of one plant where there are 2,000 lights, 35 arcs, 94 fans, 107 hp. in other motors, besides some heating and cooking appliances, and two 35 kw. generators to take care of all. True this plant has a duplicate set throughout, yet there has never been a time when it was necessary to use both sets at one time. This plant is now on a paying basis,

There was a time not many years ago when the income was almost if not quite as large as now, yet the output in current, as well as expenses was considerably larger, as the stock holders will testify. They had to go down in their pockets and pay the plant out of debt—this is only one of a thousand instances where recording meters have been the salvation of electric industries.

At the present, with so many recording meters on the market, and many of them can be relied upon in their respective places, the selection of a meter is not a difficult task. However, if you are not familiar with a meter suitable for your business, get the counsel of an engineer of experience in this particular line.

There is no place on earth where an electric current is sold that should not be measured and paid for according to amount used, whether it be for light, heat or power, each class to take its respective rate according to amount of current consumed. More consideration should be given in rate-making to number of hours used per day.

Flat rates make your crank pins flat; give your commutators flat sides; your coal pile gets flat, and your foreman gets flat on his back prostrated from overwork, while the waterworks company, from whom you get your water supply gets fat. This combination of circumstances most invariably produces a flat bank account. We have just as much right to go to a grocery or market and demand a flat rate for our month's supplies. You say to a grocer: "There are so many of us in family. Give us a flat rate for our month's groceries." It makes no difference how much you eat or how much you weigh, or how many of your friends you entertain. The grocers are on flat rate; your neighbor, who does not eat so much, does not waste so much, nor entertain so often, yet has a larger family, must help to pay for what you waste. However, I turn again to rates; I go to a residence to solicit business; I make my usual song-one lamp, \$1, two lamps, \$1.75, three lamps, \$2.25, and so on down to ten lamps at 50 cents each. The prospective customer will say: "We burn a certain number of lamps so many hours each night, and oil costs us just so much." I look around and see three of these lamps in one room. They are small hand lamps-no one burner capable of giving 4 candle power. I install a meter and one 16 cp. will light this room nicely, and you have made a permanent customer, one who cannot abuse you if your meter is properly cared for. Then I meet with swinging oil lamps, Rochester burner pattern (I have quit the flat rate to talk meter strictly). He says, "My oil costs me so much, what is your electricity worth?" A standard lamp 16 cp., will cost you one cent per hour. The next question always is: "How will this compare in light?" you must be honest enough



<sup>\*</sup> A paper read at the annual meeting of the Southwestern Gas, Electric and Street Railway Association, Waco, Texas, April 18, 1900.

to tell him that one lamp will not equal it, but it will take two or three, as the case may be, then you will have his confidence, and if your meter should stop, and you told him so, he would believe you. I tell him, "If you burn three lights a certain number of hours every night, your bill will be exactly so much for the month." After I install the meter and lights I turn the current on, lift the cover off the meter, and explain the working of it to my customer, take pains and explain it carefully. I find it easily explained in this way for the first lesson. When the first hand has made a revolution, it will cost you 10 cents, the second hand one revolution, \$1; the third hand, \$10, and so on. Of course, according to the dial, your rate and factor of meter. Turn one light on and show him how it runs, turn light off and show how it stops. I turn them all on, one at a time, and have the customer watch the speed increase. This gives him an idea why it will register just according to number of lights burning. After taking this pains you will usually have a satisfactory customer. However, not every time. I have had them complain that their meter was running too fast, when I would resort to the following test. After having the average efficiency of the lamps, and you can get this by the use of the direct-reading wattmeter, or the volt and ampere meter, which you can have in portable instruments, or, better still, if your current is direct, a millivoltmeter, with shunts for different size loads, after arriving at the efficiency take the reading of the meter. I ask the customer to turn on a certain number of lights, and burn them so many hours, keeping this information to himself, but be sure and keep it correctly. When the time is up, I have him send for me; I take the reading of the meter, subtract the previous reading and reduce this to lamp hours, according to efficiency of lamp used. Have my customer, too, reduce his time to lamp hours and compare; this will come so close, if done correctly, that you are not liable to have any more trouble with the doctor. For the next time he has a bill larger than he anticipated, he will conclude that Mary is keeping late hours in the parlor, where there is usually three or four lights.

APRIL 25, 1900.]

Next the lighting of stores, offices, lodges, hotels, public buildings, and last, but not least, saloons; for here we are abused on flat rates very much. I have known saloons to leave their fans running all night after closing, simply because it did not cost anything. These fans were their property, and they did not seem to think the cost of wear and tear equalled the satisfaction of getting something for nothing; another instance comes to my mind. I was passing a saloon one bright summer morning, and noticed an arc light burning inside. I approached the proprietor in a good humor, and asked if he needed this arc light to run this late in the morning. He said it might be turned off now, as the sun was high enough for the awning curtain to be raised without it shining in. It is needless to say that this was a flat-rate customer. I must say all classes of business should be on a meter basis. Meters in business houses are much easier located than in residences, especially when the former is of brick or stone. The latter is usually frame in our Southern country. The slamming of one door will shake the whole house. A jar is very detrimental to meters. The damage to light load meter accuracy, by reason of vibration, is much greater than is generally understood. Wearing of the jewel results almost entirely from reciprocating and not the rotary motion of the shaft. Since vibration is not always avoidable, care should be exercised to see that meters are so constructed as to permit the ready renewal of shaft, point and jewel, without the necessity of removing the meter from the point of installation. The bad effect of vibration is not confined to the jewel and shaft point. It tends to gradually shake loose fine wire connections and to cause sparking at the brushes, building up an uneven surface on the commutator. This often lifts the brush, and your meter stops until another jar seats the brush. Then your meter starts again. Dust and dirt will have the same evil effect. So it is very essential to locate meters in clean, firm places, and avoid extreme heat. If possible put it on a brick wall. Avoid thin partitions.

#### THE PROPER SIZE METER FOR LIGHTS.

This should be thoughtfully considered. A one hundred light meter, should not be expected to register correctly on two or three lights, nor a two hundred light meter on four or five lights. While it will cost a little more, it is much better, in all cases where a large number of lights are wired in, and it is known that quite often there will only be a few lights burning, to install two to three meters—stand part of the expense yourself, if you cannot convince your customer that it is to his interest, for it certainly is to yours.

#### SYSTEM OF READING METERS.

A plan I would recommend is different in some respects to the book form of duplicate dials generally in use. Use a sheet, a convenient size eight by twelve inches; this is sufficient for twenty meters, allowing four square inches to the meter. All that is necessary to go in this space of one inch by four is the name of customer, a duplicate set of dials, the face reading of meter, factor and the result. Date this sheet at the top, fill in name of the customer; not alphabetically, but group them in districts. Then you are ready to leave the office to read meters. Mark the location of each hand on its respective dial, put down the factor of meter, and number of meter, if more than one at this place. The balance is done at the office.

Some writers have suggested the plan of making heavy lighting short months by reading on the 28th or 29th of the month, and let it finally come out when the nights get shorter, or read the meter down and finally bring it all out when the bills are smaller. This I do not approve of. Every business man should be willing to pay for what he gets and it is easier to show him where it was used at the time than later on. When business is good he feels good and does not mind paying bills. If you carry a part of December account over in the spring, when he has nothing to do but kick, you will have trouble every time. It is much better to educate your customer to read his meter and teach why it will register only one light when there is but one light burning, and a dozen lights when twelve are burning.

## MOTOR SERVICE.

This should always be on the meters—first, because you must pay for what you furnish, second, because the customer should not pay for something he does not get. This is not liable to happen, for they will usually stand the wear and tear, furnish oil and let the mill run empty because it does not cost any more. The use of a meter will soon teach the customer to keep his shafting well lined up, bearings cleaned and oiled, belts and pulleys in

good condition, for this reduces friction, takes less power and makes the business more profitable and popular. Location of meters for this class is a knotty problem. I include in this all kinds of power except street railway service. In this case the meter should be located on the feeders in the station, installing meters for motor service; the meter should be placed on the station side of the controlling switch, not on the motor side. This should be done for two reasons. All forms of recording wattmeters have potential winding of fine wire, the mechanical strength of which is very low. Every time the controlling switch is used this winding is cooled or heated, and the resulting expansion and contraction causes the insulation of the wire to chafe and weaken and occasionally break off the wire. Again, when the main shaft switch is pulled, there is commonly a higher potential back kick which searches out any point of weak insulation, caused as a rule by the chafing just mentioned, breaking through and causing a burnout of the potential winding. Much, if not all, of this trouble can be avoided by placing the meter on the service side of the switch. In buildings where machinery is operated it is very hard to avoid vibration. Meters can frequently be cushioned; some few central stations provide racks which carry the meter upon a sponge rubber cushion. In cases of frame buildings, where machinery is operated. I have found it necessary to cut a hole in the floor, plant a post in the ground to support the meter; leave a space between the post and floor to prevent the post from taking up the vibration of the building. To avoid dampness, extreme heat and dust, be extremely careful in all cases to have your meter perfectly level.

The location of meters in residences is often as difficult. By all means, if possible, get your meters located on the first floor. A convenient place usually is in the back hall. First, as you of experience will know, consult the lady of the house as to where she does not want it, then you may have your choice without any disturbance. A good place is on the wall near a cross wall, or a T, just as far from a door as possible. It may be put in any room of the house except the kitchen. Put it outside before putting it in the kitchen. In fact, I have some meters for residences outside under the gallery giving good service. They require cleaning oftener, owing to our high winds bringing so much dust. No matter how careful you may be, it is hard to keep dust out of a meter. I have found a strip of soft, thin felt and a little glue put around where the cover comes down to be a great help. Vibration and dust cause our principal trouble with meters, while in colder climates insects bother a great deal, owing to the warmth of the inside of the meter. Still, they do not have so much wind in the North, consequently not so much dust, so it is about equal.

When a new meter is put in service it should be examined often, but after a year's faithful service, it will not be necessary to examine so often. I find a great difference of opinion on the care of meters, as to when and how to clean them. In my opinion the place to inspect, clean and repair a meter is in its position on the wall where it does service. Do not take the meter down to the shop, laboratory, test room or whatever you may have.

THE NECESSARY APPLIANCES FÓR CLEANING METERS,

First, you need wrenches to fit the nut and jewel pin. A pair of bellows for dusting out.

Do not use a brush at all. If your meter has permanent damping magnets, you need a thin piece of steel of suitable shape for cleaning particles of metal off the magnet. You should also have a small level to see that the meter is still in position. If your meters have commutators you should have a piece of narrow cotton tape; also a piece of fine crocus cloth. With these necessary appliances, we can now proceed to clean a meter. Lift the cover. Any dust which may have accumulated should be removed with the bellows. The condition of the jewel should be tested. If the surface feels rough, you are liable to have an injured jewel as well as shaft points. Then it is necessary to replace them; take your thin piece of steel made for this purpose and remove any particles of metal held by the damping magnet. Then place the piece of narrow cotton tape around the commutator under the brushes, and take one end in each hand, move it quickly back and forth, revolving the armature slowly. Repeat this until you have a polished surface. After this examine commutator with microscope to see that no lint is left on it. Make the necessary test, see that the meter moves off at proper speed; now replace the cover and a new seal, for meters should always be sealed. Pardon the use of the Scripture, "The first shall be last and the last shall be first." First, all of you should sell your customers a meter. Many will say we can't, but I say you can. Realizing that the rental or free system prevails throughout the United States, still it is a portion of that evil that has not yet been overcome.

#### THE GASOLINE AUTOMOBILE\*

#### BY C. J. FIELD.

I will try to give you a brief review of the development of the gasoline vehicle, here and abroad, as far as it has gone. The gasoline type of automobile is a product, you might say, of foreign manufacture largely up to a very recent period. The gasoline type of vehicle has been developed abroad, especially in France and Germany, and more lately in England, to a much greater extent than any other type of vehicle has been in those countries, largely due to the fact that the gasoline engine had been brought to a higher state of perfection and development over there than we have had it here; and also due to the fact, possibly, that electrical machinery was not so familiar to them, and the facilities for charging the batteries, etc., were not as good as in this country.

On this side, the electric vehicle, has, beyond question, up to the present time, taken a most prominent position in the minds of the public and as regards the number of vehicles introduced. This is due to the general facilities in all our larger cities for readily obtaining a recharging for our batteries. I do not intend to-night to take the position that the gasoline automobile or any one type of vehicle will meet fully the requirements of all conditions for pleasure automobile purposes or motorvehicle purposes. I believe from an electrical and mechanical engineering standpoint that each type of vehicle has its field of usefulness. Each one is going to develop more fully and broadly; and I do not think any of us is prepared to-day to take a positive stand as to which is the best. The electrical vehicle has its use for pleasure purposes in our cities where facilities for charging are readily secured, and where the question of expense and maintenance is not a paramount matter, and where the range of action, or length or range of trip you want to take with it is limited to an afternoon drive of two or three hours: in such case beyond question it serves our purpose well. But as I look at the matter, and as the public and engineers as a whole are considering the matter, that does not meet all the requirements to which the automobile must be made adaptable, if it is to take the prominent position it should. We are going to retire the horse to a limited field of usefulness in the next few years and take him from the street for general traction purposes as markedly as the electric railway has taken the horse from the streets in the traction of street cars in this country and others. But I fully believe that that development is going to be carried along not only by electric automobiles, but by gasoline and steam automobiles. The gasoline automobile, I feel, will occupy a middle ground, serving for pleasure and commercial purposes more particularly as it is being developed now, and promising a more general fulfillment of the conditions exacted than the other types. The electric automobile will confine itself to the pleasure class of vehicles, and to some limited extent for commercial uses on city delivery purposes. The gasoline automobile with the promises of future development which we have at hand will be used for general pleasure purposes and also to meet the requirements of commercial trucking and business demands. The steam automobile I will leave to my friend who follows me to explain its field of usefulness.

The first part of the gasoline vehicle to be considered is the motor. The type of motor in general use that we are familiar with is the four-cycle motor. The two cycle type of motor is practically not considered at all at this time in the motor vehicle service. The four-cycle type of motor, we understand, consists of a four-cycle operation; the first stroke drawing in a charge or mixture of gasoline and air, the the next stroke compressing that mixture through a higher atmospheric pressure. varying from 40 to 70 pounds pressure, the next stroke, being the useful stroke of the four, in which the charge is exploded and the piston driven forward. The fourth cycle is the one in which the exploded gases are expelled from the cylinder, and the cycle commences over again as just described. Therefore, with a single cylinder gasoline engine, we have one useful stroke in four. Multiplying our cylinders, taking two cylinders, we have one useful stroke in each revolution. If we have four cylinders we have two useful strokes in each revolution, if they are properly proportioned and divided. So, although as compared with a steam engine, the four cylinder gasoline engine only represents in the number of useful strokes the equivalent of a double acting single cylinder steam engine, owing to the higher mean effective pressure we carry; it is the more simple, in that the whole plant is concentrated in one motor and we have the acme of simplicity for a type of motor of that class.

These gasoline motors are divided into two classes. The first one being called the flange cooling type of motor in which the heat produced by the explosive charge is kept down to reasonable limits by the radiating of the heat from the cylinder by flanges cast on it. These flanges are thin and comparatively close together and the cylinder casting radiates the heat due to the explosions, provided the motor is placed in the proper location on the vehicle so

as to be freely accessible to draught of air while the vehicle is moving. This type of motor brings us down to the minimum of weight and simplicity of the gasoline motor for its size. But the size of the motor of this class is limited to about two or two and one-half hp. for a single cylinder of any reasonable service.

We have heard of troubles in operating gasoline motors and many of us have experienced these troubles with many of the types of gasoline motors on the market. I believe that 90 per cent. of the troubles in operating gasoline motors are due to poor electrical engineering. (Laughter.) Ninety per cent. of these troubles occur with the part of the motor which the electrical engineers of this country are going to properly comprehend and put in first-class working shape, so that the gasoline motor will be as reliable as the electric or steam motor for general purposes. Where we come to larger power than our flange cooled engine will develop, we have to use a water-jacket and some additional apparatus in the way of water circulating tank for cooling the engine. This coil represents the most efficient plan of French radiating ribs, being a thin pipe in which the copper disks are pressed closely to one another, and the coil being placed in the front part of the vehicle down on the axle, being connected up with the water tank on the inside of the vehicle, the water circulating through the coils, the action of the air passing over the coils cooling the water and keeping it below the boiling point; also keeping down the loss of water. In the latter type of vehicles, the weight of water necessary to be carried is reduced to a moderate basis, so that one to four gallons serve the purpose for a one to two days' trip, with a small loss due to evaporation.

In the gasoline automobile one of the most difficult parts of the problem is the proper vaporization of the gasoline. It is accomplished by two methods. One is called the tank method or carburetor, and the other method is the vaporizer. In the tank method, we have a body of gasoline carried into a tank, and down through the air valve; the air circulates across the surface of the tank and passes up into this valve and from that down to the engine. The air as it passes across the surface takes up a certain amount of gaseous vapor with it and goes into the valve and is controlled in quantity, while at the other end of the valve fresh air is admitted and mixed with the vapor and passes to the cylinder, being drawn in by the inlet suction stroke of the The exhaust of the engine passes through the gasoline for the purpose of warming it and assisting in the vaporization of the gasoline, so that the air will take it up. This method has been largely used abroad on small vehicles of the quadricycle and tricycle type. It is not, however, a method that has proved satisfactory for larger vehicles or on rough roads, due to the fact that when the gasoline is shaken up, the quality or richness of the mixture varies and gives us trouble in the proper operation of the engine, and entails a constant adjustment by the operator of these two valves in relation to the mixture, so that now we have in more general use for the larger type of vehicles vaporizers which work better under these conditions.

One of the types of vaporizers which is now in general use is called the floating valve system. It has a small chamber, in which a floating cylinder controls the needle valve by action of the levers. In ordinary service the gasoline is nearly opposite this nozzle. When



<sup>\*</sup> A paper read at the 204th meeting of the New York Electrical Society, New York City, March 22, 1900.

the gasoline falls below it, the float comes down and opens the needle valve and the gasoline flows in. The action is automatic. The gasoline is carried along up into the nozzle so that at the level it is just below the opening. When our engine sucks from one end it draws the gasoline from the other. At the same time it also draws in hot air at this inlet which, coming in contact with the spray of gasoline, vaporizes it, the hot air being drawn by contact with the exhaust and warmed. As it passes out, it is joined with cool air and both mixing together form one explosive charge. The principle is simply one of drawing hot air automatically and vaporizing our gasoline spray, and then mixing it with cold air before it passes to the engine cylinder. We can readily regulate the speed of the engine by varying the quantity of cold air by valve adjustment at the opening. The exploding of the vapor is done in general by one of three methods. The method which was first used and is still considerably used abroad, is the hot tube method, being a platinum tube heated up by a lamp and exploding the charge of vapor by the incandescence from that tube. The disadvantages of this method are several. One is that the time of explosion is a fixed one and therefore the speed of the engine is a fixed and constant factor. Another disadvantage of the method is that it introduces an element of danger in the operation of the gasoline vehicle due to the lamp. In case of any accident, involving the overturning of the vehicle, the lighted lamp is an element of danger, provided it comes in contact with the vapor, as has been the case in one or two serious accidents. reason for the introduction of the hot tube method was to insure a fairly reliable method of exploding the charge due to poor mechanical engineering in not being able to arrange a proper spark-exploding method. At the present time in this country, however, we are almost universally using the "jumping spark" method for exploding the charge. We are able by this method to vary the speed of our engine and vary the time of exploding the charge by a cam-action on the auxiliary shaft, being, able to vary the time of contact of the cam and changing the time of the explosion.

One of the difficulties we have to contend with in the gasoline vehicle is we have not the flexibility of the electric motor for readily varying our speed. We are placed in this position-although we can vary the speed of the engine, we cannot reduce down and get the full power of our engine. To get the maximum power of our engine we have to resort to some method of variable speed gearing which will enable us to get the maximum power out of the engine. That part of the mechanism, up to almost the present time, has been in the most crude shape of any of the mechanical features of the vehicle. There has not been up to this year on any gasoline vehicle what might be termed a first-class mechanical, economical and efficient type of variable speed gear. In general they have been a meshing of plain gears, one into the other, while they were running, throwing them into the mesh sidewise. Nominally, the vehicle should be brought to a stop and the gears thrown in. In ordinary service a layman will try to change his speed while moving and the result would be a complete disarrangement of the gears. One of the clumsy methods, being two bevel gears and two other gears which are thrown one into the other, and in that way they secure some slight modification. They will, however,

come out in some of the new vehicles this year, here and abroad, a good, efficient type of variable speed gear in which the gears are always in mesh and are giving us good mechanica efficiency and enable a ready change of speed for maximum power in hill climbing.

One of the points in connection with the frame construction of our vehicles, common to all electric, steam and gasoline, is the question of the steering point. As Mr. Riker did not touch upon it I will try to cover it briefly. We do away in the motor vehicles with the question of a fifth wheel, and turn the two front wheels by a steering arm pivoted at the back or inside the hub. The object we want to accomplish from the steering end is the reduction of the leverage to the minimum point, or the practical elimination of it, and steadiness

#### AT WORK IN A LAMP FACTORY

We are able in the accompanying illustration, through the courtesy of Bryan-Marsh Co., to show that rara avis, the interior of a lamp factory. The four rows of operatives seen are technically known as stem-makers. They take a glass tube and, after inserting in it the platinum wires, heat the glass, melting it around the platinum, thus making a seal to preserve the vacuum of the lamp when the tube has been sealed inside the bulb.

The output in finished stems in the room shown is nearly 25,000 a day at full capacity making plain stems, but in this factory, which is located at Mariborough, Mass., the highest capacity is below this figure, since a large portion of the lamps manufactured are the Bryan-



INCANDESCENT LAMP STEM MAKERS AND FLANGE ROLLERS.

in steering. One of the best methods for doing this was invented by Mr. Riker. The old-style arrangement, in which the hub is pivoted vertically outside of the rear and the steering arm off from the back, has the disadvantage of a leverage against our steering arm, due to the difference of the plane of this arm and the plane of the wheel which sometimes amounts to a variation of from four to six inches, which makes a serious objection, particularly with any wide vehicle, and requires quite an exertion on the steering handle. There is also the disadvantage that when we strike an obstruction it carries the shock to the frame.

## Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended April 21:

Argentine, 65 cases, \$5,176; Australia, 64 cases, \$5,257; Brazil, 283 cases, \$16,002; Bremen, 4 cases, \$500; Berlin, 4 cases, \$60; Bristol, 7 cases, \$1,132; Central America, 157 cases, \$6,317; Chili, 3 cases, \$101; Cuba, 306 cases, \$46,299; Dublin, 3 cases, \$125; Genoa, 6 cases, \$50; Glasgow, 218 cases, \$21,652; Havre, 145 cases \$8,361; Hamburg, 31 cases, \$5,023; Kirf, 2 cases, \$30; Liverpool, 98 cases, \$5,220; London, 150 cases, \$10,949; Manchester, 1 case, \$60; Mexico, 221 cases, \$4,991; Newfoundland, 1 case, \$19; Peru, 20 cases, \$2,532; Philippines; 50 cases, \$525; Santo Domingo, 6 cases, \$57; Southampton, 15 cases, \$616; U. S. Colombia, 2 cases, \$248.

Marsh Double Filament type, which is somewhat more expensive to manufacture than the older types, but the results obtained are so far superior that the additional cost entailed is justified. By using two filaments, which are in series, great length of carbon is secured, together with a high percentage of flashed or treated surface of graphitic carbon, which is much superior to the core or base carbon, as it better withstands the high temperatures at which the filaments must be run in modern efficient lamps.

#### SOCIETY NEWS.

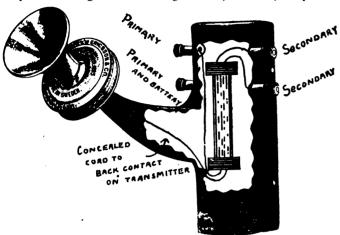
### American Institute of Electrical Engineers.

The 141st meeting of the Institute will be held at 12 West 31st street, New York City, this (Wednesday) evening at 8 o'clock. A paper will be presented by Arthur H. Ford, entitled "Hysteresis in Sheet Iron and Steel."

Applications have been received from the following candidates for associate membership, which will be acted upon by the council at its meeting May 15: J. S. Viehe; Bethlehem, Pa.; Irving B. Smith, John A. Lafore, Philadelphia, Pa.; Richard R. Bryan, Atlanta, Ga.; Frederic E. Town, Louis D. Bliss, Washington, D. C.; Ernest M. Archibald, Halifax, N. S.; S. A. Dyer, Chas. E. Johnson, Mexico City, Mexico; Philip W. Davis, Cambridge, Mass.; Arthur L.

Robinson, Charlotte, N. C.; Anderson Offutt, New Orleans, La.; Clarence Thomson, J. A. G. Trudeau, John Murphy, Ottawa, Canada: Howell J. Rossi, Puebla, Mexico; Augustus J. Bowie, San Francisco, Cal.; Herman L. Wallan, Brooklyn, N. Y.; Carl Leonard de Muralt, Paris, France; Edward J. Cook, Cleveland, O.; Arnaldo P. Zani, Milano, Italy.

The next meeting will be the annual business meeting to be held in New York, Tuesday, May 15. The general meeting will begin at



Philadelphia, in the afternoon of May 16. Paris meeting, August 16.

#### LEGAL NOTES.

The Sycamore (Ill.) Electric Light Company has gone into the hands of a receiver, Cassius M. Conrad being appointed. He will sell the plant at public auction on May 2.

The State Supreme Court of Montgomery, Ala., has decided the case of a street railroad company which enforced a rule that whites and negroes should occupy the separate portions of the car set apart for them. A negro woman was put off the car for refusing to obey the order and she sued for damages. The lower court and she sued for damages. The lower court decided in favor of the railroad and the Supreme Court affirmed the decision.

The Clyde Gas and Electric Company of Clyde, N. Y., has gone into the hands of Edward Moir of Marcellus, temporary receiver, by order of Justice Davy, upon a petition for voluntary dissolution. The corporation is insolvent. The capital is \$40,000, all paid up.

Judge Brannon, of the Supreme Court of West Virginia, has handed down an important decision in the case of the Clarksburg Electric Light Company vs. the City of Clarksburg, holding that a municipal corporation cannot grant a franchise for exclusive privileges. is contrary to the general practice heretofore.

The Chicago General Railway Company recently passed into the hands of a receiver, Judge Tuthill appointing Frank H. Sellers, trust officer of the Title Guaranty Trust Company, on petition of John H. Witbeck, former president of the company.

### PERSONAL MENTION.

Mr. F. J. Stout has accepted the position as general manager of the Toledo (Ohio), Fremont & Norwalk Electric Railway. The appointment is effective May 15.

Mr. Ellis E. Brown, formerly connected with the Poly technic School of Worcester. Mass., was lately appointed electrical engineer of the Reading (Pa.) Railway Company His headquarters will be at Reading.

Mr. Augusta Curtis Palmer, an aged resident of Utica, N. Y., died at his home a short time ago. Mr. Palmer, it is claimed, invented many valuable electric devices, and was the patentee of the first fire alarm system used in Utica.

Mr. Justin R. Carrier, formerly superintendent of transportation of the Syracuse (N. Y.) hapid Transit Railway Company, is now the superintendent of transportation of the Connecticut Lighting & Power Company and the Bridgeport Traction Company.

#### COMMERCIAL PARAGRAPHS.

#### Popular Telephones.

The attention of one of our representatives has been called to the growth in the demand for the Ericsson Telephone Company's goods, whose offices are at 296 Broadway, New York City, and we have been interested in having some of their good points explained to us.

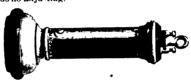
We illustrate the Ericsson Adjustable Arm Transmitter nade with cord concealed and induction coil in the base. The transmitter is the genuine Ericsson, imported from Stockholm, Sweden, and is so arranged that it can readily be put in place on the arm of the transmitter or taken off, if

for any reason it is desirable. The spring Sacoro ART live and makes a good connection. The transmitter is held firmly in place. of the arm by a screw coming through the iron of the arm and into a slot in the back of the transmitter.

> The arm adjusts conveniently up and down and meets the requirements of a short or tall person, and is a convenient length for practical purposes. The advantages of the genuine Ericsson transmitter are too well known for us to speak about them at length, but the Ericsson Telephone Company states that they will give references to those who have used the goods, and who can tell you all about them from practical experience.

> We also illustrate the double pole, horse shoe magnet receiver, which is warranted to sustain 41/2 pounds dead weight, and is made with nickel-plated magnet ends. This re-ceiver fits any standard hook and is an all-

metal receiver, so made that the changes of temperature will not affect the adjustment, hence it is "never changing ' and needs no adjusting.



This company is making a specialty of the Ericsson Talk ing Circuit, consisting of the adjustable arm transmitter with cord concealed, the Ericsson receiver, induction coil and receiver cord. The great advantage of this Talking Circuit is its equality or even balance, meaning the balancing of the resistance of the two circuits by the use of this special induction coil, which makes the Talking Circuit superior to all others, either for short or long distance work, and produces the best results. For proof of this they refer to numerous customers, who are not only growing in number, but whose requirements are constantly increasing for their different exanges. Many customers are substituting this Talking Circuit for the one originally supplied with instruments, finding that the Ericsson is so far superior and that it is an economy to make the change.

The Ericsson Company make a varied line of complete instruments, which we are unable to illustrate at this time, together with switchboards for ground line and metallic circuits, also multiple switchboards up to the highest capacity.

## Removal Notice.

The Standard Underground Cable Company announces the removal of its New York offices on April 30 to more commodious quarters at No. 56 Liberty street (corner of Nassau). and at the new location will be glad to welcome its customers and friends.

#### INCORPORATIONS.

The Union Electric Light Company, Hackensack, N. J. Capital stock, \$25,000. Incorporators: Genest W. Ottignon, George T. Davison and John J. Bate.

The Delaware and Susquehanna Electric Light Company, Cecil County, Md.-to build a railway from the Susquehanna River to the Delaware State line and construct the necessary branches; also to generate and sell electricity. Incorporators: John S. Rossell and others,

The Casper Electric Company, Casper, Wyo.-to furnish light, heat and power. Capital stock, \$20,000. Incorporators: C. H. King, F. Salathe and T. M. Becker, all of Casper.

The Chillicothe & Hillsboro Traction Company, Chillicothe, O .- to build an electric line between the two cities. Incorporators: W. A. Wallace, Edward L. and G. L. Warson, Dayton; M. McKeehan, Hillsboro, and H. T. Glenn, of Cin-

The Osborn Electric Railway Encampment Manufacturing Company, Cheyenne. Wyo.-to manufacture electrical supplies, etc. Capital stock, \$250,000. Incorporators: B. E. Osborn, J. A. McGeer, J. H. Pearson, F. E. Cody and C. F. Parcells, all of Auburn, N. Y.

#### ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FORRIGN PATENTS. at 302 and 301 Broadway (Room 1201), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N.W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

#### LETTERS PATENT ISSUED APRIL 17, 1906.

#### ELECTRIC RAILWAYS AND APPLIANCES.

ELECTRIC RAILWAYS AND APPLIANCES.
647,624. Trolley-Fork. Elias Eddy, New York City. Filed Aug. 9, 1899.
647,637. Switch-Operating Mechanism for Railways. Charles W. Squires and James B. Squires, Springfield, Mass. Filed April 12, 1899.
647,666. Electric-Railway System. John M. Murphy, Torrington, Conn., assignor, by direct and meene assignments, to the Safety Third Rail Electric Company of New Jersey. Filed Sept. 3, 1897. Renewed June 9, 1899.
647,748. Plow for Conduit Electric Cars. James B. Gottsberger, New York City. Filed Jan. 4, 1900.
647,751. Car Brake and Fender. John D. Long, Chicago. Ill. Filed Nov. 6, 1899.
647,889. Trolley-Wheel. Charles S. Johnson, East Liverpool, O. Filed Jan. 24, 1900.

#### ELECTRIC LIGHTS AND APPLIANCES.

647,534. Electric Lighting Apparatus for Railway-Cars. Willard F. Richards, Buffalo, N. Y., assignor to Charles M. Gould, New York City. Filed Jan. 19, 1900. 647,691. Electric-Arc Lamp. John T. Beswick, New York City. Filed Feb. 6, 1900. 647,874. Electric-Arc Lamp. Charles A. Pfluger, Chicago, Ill. Filed Aug. 7, 1895.

#### ELECTRICAL MACHINERY AND APPARATUS.

ELECTRICAL MACHINERY AND APPARATUS,
647,456. Automatic Maximal Switch for Electric Power and
Lighting Currents. Theodor Allemann, Olten, Switzerland. Filed Dec. 4, 1899.
647,492. Electromagnetic Switch Arrangement. Paul Hoffmann, Charlottenburg, Germany. Filed Dec. 5, 1899.
647,584. Inductor-Alternator. Sidney H. Short, Cleveland,
O., assignor, by mesne assignments, to the Westinghouse
Electric & Manufacturing Company, Pittsburg, Pa. Filed
Sept. 1, 1898.
647,585. Means for Balancing Multipolar Electric Machines.
Sidney H. Short, Cleveland, O., assignor, by mesne assignments, to the Westinghouse Electric & Manufacturing
Company, Pittsburg, Pa. Filed Nov. 2, 1898.
647,716. Method of Regulating Electric Machines. William
H. Cooley, Brockport, N. Y. Filed Dec. 28, 1899.
647,738. Electric Motor Controller. Hayward Cochrane,
Chicago, Ill. Filed June 15, 1899.
647,788. Switch Apparatus for Electric Current-Distributing
Circuits. Theodor Allemann. Olten, Switzerland. Filed
Nov. 22, 1899.
647,829. Electric Switch. James I. Gunther, New York City.
Filed Oct. 4, 1899.
TELEPHONES AND TELEPHONE APPARATUS.

TELEPHONES AND TELEPHONE APPARATUS.
647.588. Combined Telephone and Electrothermostatic Fire-Alarm System. George K. Thompson, Malden, Mass., assignor to the American Bell Telephone Company, Boston, Mass. Filed Aug. 5, 1899.
647,737. Tablet Attachment for Telephones. Glenn S. Williamson, New York City. Filed Nov. 23, 1899.
647,924. Pulley for Overhead Telephone-Cables. William H. Kennedy, Akron, O., assignor of one half to Dayton A. Doyle, same place. Filed March 7, 1900.

647,924. Pulley for Overhead Telephone-Cables. William H. Kennedy, Akron, O., assignor of one half to Dayton A. Doyle, same place. Filed March 7, 1900.

MISCELLANEOUS.
647,475. Battery-Handling Attachment for Motor-Vehicles. George H. Condict, New York City, assignor by mesne assignments, to the Columbia and Electric Vehicle Company, Jersey City, N. J., and Hartford, Conn. Filed Dec. 16,1898.
647,526. Zinc-Support for Batteries. Samuel E. Smith, Beloit, Wis. Filed April 17,1899.
647,526. Electric Thermostat for Fire-Alarms. Hammond V. Hayes, Cambridge, and George K. Thompson, Malden, Mass., assignors to the American Bell Telephone Company, Boston, Mass. Filed Aug. 10, 1899.
647,589. Induction-Coil. Richard Varley, Jersey City, N. J. Filed Feb. 21, 1900.
647,589. Induction-Coil. Richard Varley, Jersey City, N. J. Filed Feb. 21, 1900.
647,647. Electric Furnace. Marcus Ruthenburg, Philadelphia, Pa. Filed Nov. 22, 1899.
647,644. Electric Furnace. Marcus Ruthenburg, Philadelphia, Pa. Filed Nov. 22, 1899.
647,647. Electric Gas Lighting Device. Gustav Schunemann and Otto Rieder, Buda-Pesth, Austria Hungary. Filed April 29, 1899.
647,647. Electric Insole for Shoes. Henry O. Can Dec. Syracuse., N. Y. Filed Aug. 30, 1899.
647,647. Electric Metal-Working Apparatus. George D. Burton, Boston, Mass. Filed Aug. 11, 1898.
647,724. Apparatus for Recording Morse Telegraphic Characters. Charles Stevens, Charles C. Vyla, and William Milner, London, Eng. Filed Nov. 13, 1899.
647,741. System of Electrical Transmission. Frederick Bedeil, Ithaca, N. Y. Filed April 24, 1899.
647,753. Storage-Battery Electrode. Roderick Macrae, Philadelphia, Pa., assignor of one-half to William C. L. Eglin, Philadelphia, Pa., assignor of one-half to William C. L. Eglin, same place. Filed Nov. 17, 1899.
647,754. Storage-Battery Electrode. Roderick Macrae, Philadelphia, Pa., assignor of one-half to William C. L. Eglin, same place. Filed Nov. 17, 1899.

1899. 617,914. Battery-Receptacle for Electric Vehicles George H. Condict, Hartford, Conn. Filed Aug. 21, 1899.



## GENERAL NEWS.

What is Going On in the Electrical World.

#### LIGHTING.

Alliance, O.—O. W. Pfouts, city engineer, has pre-pared plans and specifications for the erection of an electric light plant at this place.

Beaver Dam, Wis.—The property of the old electric light company was recently turned over to the new company. The capital stock of the latter will be \$52,000. The plant is to be entirely rebuilt.

Cheney, Wash.—The project of supplying electric power and light at this place from Spokane Falls, 16 miles away, is under consideration by the proprietors of the water power.

Chicago, O.—This town has voted to issue \$15,000 in bonds for an electric light plant.

Conemaugh, Pa.—This village will receive bids in about a month for an electric light plant to cost \$12,500 and run forty 2,000-cp. arc and two thousand 16-cp incandescent lights. Address S. M. Snyder.

Eaton Rapids, Mich.—The Hughes & Welch electric lighting plant is to be enlarged and improved. A new dyname with double the capacity of the present one will be purchased and the power increased.

Elkader, Is.—Messrs. Stopps & Williamson have been awarded the contract to erect an electric light plant

Fredericksburg, Va.—The council has authorized the light committee to advertise for bids for erecting an electric light plant.

Gaffney, S. C.—There is to be an electric light plant erected on Broad River at this place.

Galena, Ill.—The city council has decided to purchase a site and erect thereon an electric lighting plant. Georgetown, S. C.—The Georgetown Electric Com-

Georgetown, S. C.—The Georgetown Electric Company wants estimates on a complete electric light plant.

Hartford, Conn.—Thomas C. Perkins of this city, representing Hartford and Boston capitalists, has been trying to interest the Warren selectmen and the officials of the towns of Brookfield, West Brookfield and North Brookfield, Mass., in an electric light plant and furnish streat lights. to furnish street lights.

Lakewood, O.—Bids will be received in July for erecting a plant to cost \$15,000 to operate 100 arc lights. Address R. F. Wood, engineer.

Litchfield, Conn.—The Litchfield Electric Light & Power Company is preparing plans for a new electric light plant.

Lowellville, O.—B. P. Foster of Cleveland has been awarded the contract to erect an electric light plant

Madisonville, O.—The issuance of \$10,000 in bonds for an electric light extension will be voted on at a special election this month. Address Village Clerk B. Carter.

Marianna, Ark.—The electric light plant of the Marianna Gin & Manufacturing Company was recently destroyed by fire.

Morris Plains, N. J.—An appropriation for the installing of an electric light plant at the New Jersey State Hospital for insane persons will be asked for.

Nashville, Tenn.—The city council has passed the bill to issue \$150,000 worth of bonds to build an electric

New Wilmington, Pa.—An electric light plant is to be erected here.

Osgood, Ind.—J. Eckert is chairman of a special committee appointed to secure data, etc., for a municipal electric light plant to furnish fifty 1,200 candle power arc and six hundred 16-candle power incandescent lights.

Palatka, Fla.—T. B. Anderson, city clerk of this place, advertises for bids for lighting the city for a term of five years.

Pittaburg, Pa.—The Pittaburg & Lake Erie Railroad Company will erect an electric light plant on Smithfield street.

Pocomoke City, Md.—This city will soon vote on the question of issuing bonds for erecting an electric light plant. R M. Stevenson, mayor.

Beading, Pa.—An electric light plant will soon be installed in St. Joseph's Hospital at this place.

Biverside, Cal.—At a recent election it was voted to issue \$40,000 in bonds for the purpose of erecting an electric light plant.

Shakopee, Minn.—A petition signed by over 150 citisons was presented to the common council asking that
body to submit to the votors of the city the proposition
of issuing bonds, to be used in building and operating
an electric light plant.

Shreveport, La.—The W. K. Henderson Iron Works of this city is in the market for a dynamo of 100 lights.

Southampton, N. Y.—The council has granted a franchise to W. B. Betts for an electric light plant.

South River, N. J.—This town will build an electric light plant to run 40 arc and 500 incandescent lights.

Thomaston, Ga.—The city council desires to establish an electric light plant or to contract with individuals for lights for streets. Bids are solicited. Address T. Adams, clerk, Thomaston, Ga.

#### STREET RAILWAYS.

Charlotte, N. C.—President Orr, of the Anderson (S. C.) Water, Light & Power Company, has submitted a proposition to the town council for a franchise to construct an electric street railway in this place.

Dayton, O.—The contract for the construction of the Dayton and Troy line has been let to John W. Coffman, of New York City. The line will extend along the Dayton and Covington pike, and will take in Harrisburg, Union, West Milton, Pleasant Hill, Ludlow Falls and Covington, and then extend from Pleasant Hill to Troy.

Delaware, O.-D. E. Sullivan and T. A. Simons of Columbus have secured the right of way to construct an electric road from Worthington to this city. Work will soon begin on its construction, and an electric power plant will be located at a point between Columbus and Delaware which will cost \$50,000.

Glenside, Pa.—A proposition to build a five-mile trolley line from Branchtown to this place is being promoted by William T. B. Roberts, the real-estate operator, who has 550 acres of land here that he proposes to make available for improvement by the construction of this line.

Jersey Shore, Pa.—Permission has been granted to the Jersey Shore Electric Street Railway Company to erect poles, lay tracks, and run cars through certain prescribed streets of this town.

La Porte, Ind.—The commissioners of La Porte County have granted a new franchise to the Northern Traction Company, who propose to build an electric line from Michigan City through La Porte to South

Lockport, N. Y.—The Lockport & Olcott Railway Company with a capital of \$200,000 was recently formed to build a trolley line through Niagara County from Lockport to Olcott. W. Van Horn, W. V. Corwin, H. J. Pierce and J. E. Pound are the directors.

Mountainside, N. J.—The residents of this borough will present a petition to the Westfield & Elizabeth Street Railway Company, asking that this place be included in the route of the trolley line to Springfield.

Orange, Mass.—The question of building an electric railroad from here to Miller's Falls is now being agitated. It is claimed it will cost about \$150,000, and if patrons along the line of the road will subscribe to the amount of \$50,000, the company will furnish the other \$100,000 and build the road.

Peru, Ind.—A company is being organized composed of capitalists of this city, of which C. H. Brownell and R. A. Edwards are at the head. Its object is the construction of an electric railroad from here to Converse.

Pontiac, Mich.—The promoters of the Pontiac Orion Electric Railway announce that the line will be built as soon as the weather permits. A stock company will be organized with a capital of \$175,000.

Richmond, Ind.—Messrs. Freeman & Lontz, promoters of an electric line from this city west to Cambridge City and other points, have given a \$10,000 bond as a guarantee that the road will be built.

Sterling, Ill.—Diller & MacMillan are the promoters of a scheme to build an electric railroad from here to Dixon, Cregon, Byron and Rockford.

#### COMPANY MATTERS.

Baton Rouge, La—The Home Electric Company has recently been considering the proposition of John D. Fisher, who will in all probability become the purchaser, after which the stock will be bonded and the capacity of the plant increased.

Connellsville, Pa.—The Connellsville & Uniontown Electric Railway Company will build a power house to cost \$230,000. The road is to be extended from Mt. Pleasant to Fairchance via Alverton. Scottdale, Pennsville, Connellsville, Dunbar and Uniontowa. The plans also include a line from Scottdale to Pittsburg via West Newtown and Monongahela City. The right of way has all been secured. of way has all been secured.

Huntsville, Ala.-The Huntsville Railway, Light & nuntsville, Als.—Ine Huntsville Kallway, Light & Power Co. is making extensions in its power house, and will put in new machinery for electric street lighting. An extension of the railroad to Monte Sano is generally believed to be one of the immediate probabilities of the year. President Dupont has the matter under advisement.

ment.

Indianapolis, Ind.—The Power Building Company, with a capital stock of \$300,000, will soon begin the construction, at New Jersey and Washington streets of an immense building that will furnish to manufacturers space, power, light, heat, etc., at nominal cost. Power will be produced by compound engines and direct-connected electric generators. The building will be heated by hot water and lighted by electricity.

Ludlow, Ky.—The Kentucky Electric Company has increased its capital stock to \$50,000 for improving its

Marion, Ind.—The Marion Electric Company receive bids about May 15 for a new power house and two 250 hp. boilers, engines, dynamos, etc.

dent Altred Skitt of the Manhattan Elevated Railway Company to the Department of Buildings for a three-story electric power house for the new third rail system, which the company is about to substitute for the pres-

ent motive power. The structure will cast about \$750,000. It is to be erected in Exterior street, between The structure will cust about Seventy-fourth and Seventy-fifth streets.

Xenia, O.—The Xenia Electric Light & Power Company has increased its capital stock from \$10,000 to \$50,000 to improve its plant. J. D. Steele is president.

#### MANUFACTURING.

Chicago, Ill.—J. M. Atkinson, W. E. Pimlott and J. S. Cummings of this city are the incorporators of the J. M. Atkinson Company, which was recently formed to manufacture electric machinery and supplies—The Osburn Electric Manufacturing Company of this city has changed its name to the Electric Supply Company.

Cincinnati, O.—Moritz Boninber, a capitalist from Cologne, Germany, was recently here purchasing electric machinery. He closed a contract with W. G. Wagenhals, president of the W. G. Wagenhals Manufacturing Company, for the use of his slow-feed electric handle used on electric cars, for all Europe.

Cumberland, Me.—A company known as the Cham-pion Electric Belt Company with a capital of \$500,000 will manufacture and deal in all kinds of electrical ap-paratus and letters patent for similar devices.

Utica, N. Y.—With the awarding of a contract to the firm of I. P. Morris & Co., Philadelphia, for the manufacture of four large water wheels, the Utica Electric Light & Power Company made the last necessary provision for the construction of the plant, which is to be the means of converting the power at Trenton Falls into currents of electricity to be used for illumination, and for purposes of manufacture in this city.

#### POWER AND TRANSMISSION PLANTS,

Athena, Ore.—The company formed here to harness the power of the Walla Walla River, has finally decided the power of the Walla Walla River, has maily decided to go shead and inaugurate the enterprise. A plant to cost \$100,000 will be installed, and power will be transmitted from the upper waters of the Walla Walla River to Walla Walla, Wash., and to Athena and Weston, Ore.

ton, Ore.

Burlington, Vt.—The Vermont Electric Company has purchased the water rights north from the Hunter & Shiland dam at Essex Junction, up the Wincoski River to the termination of the rapids of S. E. Brownell. The scheme proposed by Manager Dr. W. S. Vincent is for the building of a dam across the river where it is about 300 feet wide; and also the erection of a power station. A generator of 2,000 horse power will be installed, and connections will be made with the gorge power station by means of the three-wire system.

Congwinge Md.—Suppose have been applied for

Conowingo, Md.-Surveys have been completed for conowingo, Md.—Surveys have been completed for the great hydro-electric works on the Susquehanna River near this place. The works will be of the magnitude of those at Niagara, and it is expected to furnish electrical power to Philadelphia and Baltimore. The first station to be erected will contain water wheel and dynamo capacity for 59,000 electrical horse power.

and dynamo capacity for 57,000 electrical horse power.
Leadville, Col.—A company headed by several
wealthy mine owners, including John F. Cambian,
Seeley W. Mudd, William Byrd Page and Charles Baettcher, proposes to establish an immense water-power
electrical generating station on Esgle River, twentythree miles from this city. The present plans contemplate four three-phase units of 1,000 kilowatts each,
and the full capacity has already been contracted for.

and the full capacity has already been contracted for.

Watertown, N. Y.—Last year the Black River Traction Company purchased a water power on Black River between Felt's Mills and Great Bend, and plans are now being formed for the erection of a power plant on this water power site. The current will be brought to this city and with one storage battery at Dexter will operate the road.

## AUTOMOBILES.

Akron, O.—This city is the possessor of the first automobile patrol wagon in this country. It is of the electric type, being driven by two six-horse-power motors, capable of a maximum speed of 20 miles an hour. The battery is of 40 cells, and one charging will carry the vehicle 25 miles. An electric headlight and an electric alarm gong give warning of the approach of the vehicle, while a smaller light in the top of the wagon gives ample illumination for the interior. In actual service it has been run through mud six inches deep, with as many people in it as could be seated.

Zylonite. Mass.—It is stated that the plant at this

Zylonite, Mass.—It is stated that the plant at this place, which was formerly a celluloid industry, will be henceforth devoted to the manufacture of automobiles. A sample machine was made and sent to New York. This proved so satisfactory that the projectors of the plan will commence at once on a large scale the making of these machines.

Idaho Springs, Col.—The Pine Shade shaft is sinking by hand, but it is expected that arrangements will be made for the installation of electricity, overtures having been made by Manager May of the Seaton Company to the Idaho Springs Electric Company, with a view of running wires from the town to the mine.



# THE TELEPHONE WORLD.

#### Municipal Telephones for Chicago.

A dispatch from Chicago says that city is to have a municipal telephone system. Its immediate use is to be confined to the Police and Fire Departments, but its projectors say that eventually it will serve as the nucleus of a great metropolitan system that is expected to become a healthy rival to the Chicago Telephone Company and the New Illinois Telephone & Telegraph Company. Rates sufficiently low to make the telephone a cheap convenience are predicted by those who see a great future in the municipal plant.

The infant telephone system was launched on Friday, when City Electrician Ellicott advertised for bids on 1,500 instruments. Later he will ask for prices on enough insulated wire to make the necessary connections. The conduits have been completed, so that with the purchase of the apparatus, no delay will be met in installing the system. The Chicago Telephone Company has had an annual rental of \$8,000 from the city.

#### Telephone Men Active in the Bay State.

Franchises for competing telephone companies have been granted by the cities of New Bedford, Fall River, Springfield and Brockton, Mass., within the last few months. The exchange at New Bedford will be in operation on June 1, and the construction in Fall River has already been begun. Springfield and Brockton are to be started immediately. We are informed that the New England Telephone & Telegraph Company has again reduced its rates in Haverhill, making a special line rate of \$54, in place of \$96, and \$36 in place of the \$57 rate for party line, unlimited service. These rates include a free residence telephone, making the New England rate to-day about 25 per cent. of what it was in Haverbill. before the People's Telephone Company began operations. These other cities of Massachusetts have been convinced of the benefits of competition largely through the efforts of the People's Telephone Company, which has been so successful in lowering the price and improving the service in Haverhill.

The Bell Telephone Company of Buffalo, N. Y., will soon commence the construction of its new line from Buffalo to Rochester. The new line will connect with the present line from Le Roy to Churchville at Bergen. It will then be extended from that village east along the State road, thence down the Bromley road to Chili station, where a new office will be opened. From there the line will follow the Central tracks to Rochester, keeping on private property the entire distance.

The Cumberland Telephone Company has withdrawn its construction forces from Louisiana, and has ordered them into Mississippi, as a result of the present local agitation against the telephone companies in New Orleans. Work is not to be resumed in Louisiana until the State Railroad Commission has decided the cases\_pending before it.

The Mariaville and Schenectady (N. Y.) Telephone Company has recently been organized. The new company has purchased piles, and expects to have its line in working order by May 15. The officers are as follows: President, R. C. Cullings; secretary, C. A. Cullings; treasurer, D. N. Walpole; directors: Frederick Frost, Samuel Robinson, D. N. Peck and Delmont Gregg.

Articles of incorporation of the Dubuque (Iowa) Telephone Company have been filed with the county recorder. The incorporators are V. H. Stevens, R. W. Stewart, J. H. Ellsworth, O. J. Hager, D. A. Howe, C. A. Beeman and L. J. Cass. The capital stock is \$100,000, divided into shares of \$100 each. The amount paid in is \$25,000. The purpose of the company is to maintain a telephone exchange in Dubuque.

The Central Union Telephone Company of Indianapolis, Ind., has decided to make a number of changes in its business methods beginning the first day of May. There will be two divisions of the company's system—one in northern and one in southern Indiana. The headquarters for the northern division will be South Bend and Indianapolis will be the southern headquarters.

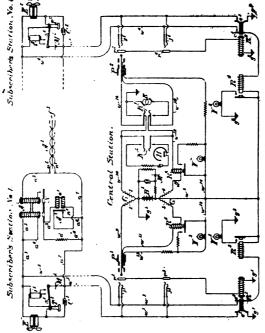
The San Jose (Cal.) Telephone Company has filed articles of incorporation in the office of the Secretary of State of California, the capital stock being placed at \$250,000. The articles show that it is the intention of the company to extend its line from San Jose to San Francisco.

After a hot fight in West Superior, Wis., waged by those favoring the opposing telephone companies, the council has voted to refuse to allow the local Bell Company to maintain telephones in the city hall.

The list of telephone subscribers in Cincinnati is 1,000 greater now than it was a year ago, and applications are being made at a rate each day that is surprising.

## A Telephone and Electrothermostatic Fire Alarm System.

The United States Patent Office issued letters patent on April 17 to George K. Thompson on a combined telephone and electrothermostatic fire alarm system, herewith illustrated. The claim made by the inventor is as follows: "In a common battery telephone exchange, the combination with a subscriber's outfit at a subscriber's station, the line leading therefrom to the central station, the common source of elec tromotive force, and the electromechanism at said central station adapted to be used in connection with said subscrib-



er's station, of an electrothermostat, in a branch parallel with the branches containing the instruments of said subscriber's outfit, adapted when operated by heat to close a circuit over said subscriber's line and set up therein a current from said common source of electromotive force, a continuously-acting circuit-modifier, an electromagnet so arranged that the said current established by the operation of said thermostat will pass through its winding, and an armature for said electromagnet in electrical connection with said continuously-acting circuit-modifier and so arranged that, when attracted by said electromagnet, it will make electrical connection with said winding and thereby bring into circuit with said common source of electromotive force said continuously-acting circuit-modifier, substantially as described."

#### Independent Telephone Lines.

The owners of independent telephone lines covering Eastern Kansas and Western Missouri held a convention in Fort Scott, Kan., recently. Reports indicate that the mileage of independent lines is increasing very rapidly and it has been practically decided that a Maltese cross will be adopted as the sign of all independent toll lines.

The Railroad Commission of Louisiana has taken steps to prevent telephone companies from raising their rates as they had announced their intention of doing. Two rules were re-enacted, and amended as follows: There shall be no increase in the rates now charged for rent of instruments, or for the use of public station instruments for conversation, without the consent of the commission; nor shall any rates be put in force at new exchanges, or on new toll lines, or elsewhere, before said rates shall have been authorized by the commission.

At a meeting of the stockholders of the Central Pennsylvania Telephone & Supply Company of Williamsport, Pa., on the 20th inst., it was voted to increase the capital stock of the company from \$1,000,000 to \$1,500,000. A large portion of the increased capital will be used in repairing lines and erecting new ones.

The United Telephone & Telegraph Company, which controls the Maryland Telephone Company and lines in Wilmington, Washington, Pittsburg and Allegheny, has established in Baltimore a plant for the manufacture of all the instruments which will be needed for the conduct of its business.

There are 7,000 telephones in Oakland, Alameda and Berkeley, Cal., and in San Francisco there are 20,000.

#### To Spot Wire-Tappers.

M. J. Jordan of Derby, Conn., has shown his inventive capabilities in a telephone indicator which he will shortly place on the market. The indicator is used on telephones so that any person using the wire can tell in an instant if there is anyone tapping it. The device is placed inside the upper cabinet where the wires and mechanism are concealed, and is so arranged that the moment the receiver is lifted from the hook the indicator will register the number of the 'phone tapped in the central office by the ringing of a bell. The person using the wire can hear the alarm which is sent in as well as the operator, and so accurate is the alarm there will be no question as to who lifted the receiver.

#### The Park Rapids Telephone Exchange.

There are many flourishing exchanges in operation in Minnesota, but probably none more prosperous—considering the time it has been in operation—than that at Park Rapids. This town has a population of but 1,200, yet in spite of this fact the local exchange in three months got over 180 subscribers with a prospect of many more in the near future, As a local paper states "it is doubtful if there is a town of the same size within the limits of the United States where a larger number of subscribers has been secured to a local exchange, nor an exchange that is giving better satisfaction to its patrons." This satisfactory state of affairs was brought about through good management combined with excellent service at low rates, and last, but not least, to the individual efforts of Mr. A. B. Kerlin, president of the Northern Min nesota Telephone Company.

The Keystone Telephone Company ordinance, which conveys sweeping rights to construct and maintain conduits, cables, wires, terminal poles and manholes throughout the city of Philadelphia, Pa., was rushed through councils' electrical committee, Thursday, eliciting little discussion, a few unimportant amendments, and encountering no opposition. The bill went to select council in the regular routine, and was laid over to be printed.

The board of aldermen of Brockton, Mass., by a vote of 5 to 2, granted a franchise to the Massachusetts Telephone & Telegraph Company, which comes into the field as a competitor with the present New England Company. The new franchise reduces the assessment upon the company's gross earnings to 1 per cent., instead of 2, as at first required.

A Boston company is to manufacture a new antiseptic mouthpiece for telephones, having a metal shell shaped to fit the interior of the mouthpiece, with spring tongues to hold it in place, the exposed surface being covered with a quick-hardening gum which carries the disinfectant.

The Chesapeake & Potomac Telephone Company will, within a month, begin the erection of two buildings, to accommodate branch exchanges of the telephone system in Washington, D. C. Sites for the buildings have been purchased.

The Granville (Vt.) Telephone Company has placed a \$2,000 order with a telephone manufacturing company of Chicago for telephones and switchboards for the Salem and Cambridge exchanges.

The line of the People's Telephone Company to Pittston. Pa., has been opened. Work on the company's lines in Scranton will be begun in a short time.

The Home Telephone Company of Buffalo, N. Y., will have its entire system covering that city in operation by the first of May. There are about 500 subscribers.

#### TELEPHONE INCORPORATIONS.

The Hartsville Rural Telephone Company, Hartsville, Ind. Directors: Alvin Swain, James Mehaffey, W. N. Bradley, James Jordan and Thomas Swain.

The Kansas City Telephone Manufacturing Company, Kansas City, Mo.—to manufacture telephone and electrical appliances. Capital stock, \$5,000. Incorporators: E. L. Foutch, F. M. Bernardin, E. R. Boyer, all of Kansas City. Lathrop. Morrow, Fox & Moore, attorneys, Kansas City.

The Brownstown Telephone Company, Brownstown, Ind. Capital stock, \$5,000. Directors: Frank Branaman, C. F. Robertson and I. N. Persinger.

The American Toll Telephone Company, Cleveland, O.—to manufacture machines for toll messages. Capital stock, \$10,000. Incorporators: W. A. Foss, E. S. Kaneen, A. V. Hegeman, L. A. Fanon, B. G. Nichols.

The Panhandle Telephone Company of Childress, Texas. Capital stock, \$5,000. Incorporators: R. H. Norris, B. B. Bates and W. N. Notes, all of Childress.



## SECURITIES. ECTRICAL

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Year from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem if a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gcn., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mig., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

PASSENGER RAILWAYS.						PASSENGER RAILWAYS.							
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Troy City Railway.)							Holyoke Mass.—Apr 23 Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June, '98.	2073	212
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B idgeport Traction Co.	100	2.000,000	2,000,000	1 % Aug., 96.	105		™Indianapolis Street Ry	1	5,000,000	5,000,000	•••••	38	831/4
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Brooklyn N. Y Apr 23.  trooklyn City Ry  brooklyn Rap. Transit Co., tr certf.  cBrooklyn Heights Railroad	. 100	200,000	48,000,000 200,000	*************	235 7 1 107	236 74¾ 109	Twin City Rapid Transitcom Twin City Bapid Transit? % pfd. Montreal, Canada.—Apr 23: Montreal Street Ry. Co.	50	8,000,000 4,000,000	1,712,200 4,000,000	13/4 % Oct., '98 8 % S., M. & N.	688 n 186 260	187 2913/4
*dBrooklyn Olly RRguar «Brooklyn, Queens Co. & Sub. RR. Coney Island & Brooklyn RR Kings County Elevated	100	2,000,000 2,000,000 4,750,000	2,000,000 1,884,200 4,750,000	8½ % Q., Jan., 2½% Nov., '99	257 325	330	Memphis Tenn.—Apr 23: Memphis Street Railway Co			6,000,000 500,000	134 % S., J. & J.	25	99
Kings County Traction Co	50	4,500,000 6,000,000 2,000,000	4,500,000 6,000,000 2,000,000	1 % July 26, '97	75 ::	80	New Haven, Conn.—Apr 23; Fair Haven & Westville RR New Haven Street Railway Co	25 100	2,000,000 1,250,000	2,000,000 1,000,000	8 % S., Sept. '98. 2½ % A., July '96.	89	41
Buffalo N. Y.—Apr 23: Buffalo & Niagara Falls Elec. By Buffalo Rallway Oo				1 % Q. Dec., '59	74 90	75 91	New Haven & Centerville	25		800,000 600,000		45	46
Columbus O.—Apr 23 Columbus Street Railroad Columbus Stree Bailroad, pfd	. 100	8,000,000	8,000,000	1 % Q., Feb., '99	25 88	25 % 84	Canal & Claiborne RR. Co	100	1,200,000	1,200,000	4 % 8., July, '98.	1485 225 95 205	24 96
Charleston, S. CApr 23 Charleston City Ry. Co	50 26	100,000 1,000,000	100,000 <b>350,00</b> 0	8 % b.	::	::	Orleans RailroadSt. Charles Street Railway	100 50	2,000,000 500,000	2,000,000 185,000 1,000,000	8 % 8., Jan., '99. 4 % 8., Jan., '99. 1½ %., June, '94. 1½ %. Oct., '98.	561/4	52
Chicago, III.—Apr 22 Chicago City By. Co. Chicago & South Side R. T. RR. Lake Street Elevated RR. Metropolitan West Side Elev. By Met. West Side Ele, pfd. North Chicago Street RR. North Chicago City RR. Seuth Chicago City Railway. West Chicago St. Re. Co. Union Traction Ry	100 100 100 100 100 100 100	10,828,800 10,000,000 15,000,000 15,000,000 10,000,000 2,000,000 20,000,000 1,250,000	10,828,800 10,000,000 7,600,000 9,000,000 6,600,000 249,900 1,608,200 18,189,000 624,900	Feb 28 1900.  8 % Q., Jan., 99  11/4 % Q. Feb 99	274 111/2 27 80% 219 	28 801/6 220	New York—Apr 23: Central Crosstown Rk cChristopher & 10th Sts. RRguar Dry Dock, E. Brdw'y & Battery RR. dMetropolitan Street Ry. Co. sBleecker St. & Fulton Fy. Ry. guar /Broadway & Seventh Ave guar gOen.Park, N.&E. Rivers RR. guar hEighth Avenue RR 1242 St. & Grand St. Ferry RR. guar /Ninth Avenue RR guar /Twenty-third St. R. R. Co guar	100 100 100 100 100 100 100 100 100	750,000 800,000	748,000 800,000 3,000,000	4% % Q.	395 198 205	800 185 125 158 <sup>1</sup> / <sub>2</sub> 36 285 207 400 410 205 210
Cincinnati, Ohio.—Apr 23: Cincinnati Inc. Plane Bycom Cincinnati Inc. Plane Bypid	•I &£	1,000,000 150,000	575,000 150,000	1/4 % Feb., 199	::		Second Avenue RR. Third Avenue RR. m42d St., Manhatv'le & St. Nich. Av *Union (Hucklaberry) Ry.	100	2,500,000	2,500,000	***************************************	199 16954 60 190	201 1098/4 60 <b>200</b>
Cincinnati, Newport & Cov. 81. By Cincinnati Street Ry. Co	100	4,000,000 18,000,000 2,500,000	8,500,000 14,000,000 2,200,000	½ % Feb., '99 2½ % Feb., '98. 1½ % Q., Jan., '49 1½ % Q.,Jan., '99.	89 1243	89 125	Newark N. J.—Apr 23 Consolidated Traction Co. of N. J North Jersey Street Railway Co.	100	15,000,000 6,000,000	15,000,000 6,000,000	***************************************	<b>60</b>	61 29 <b></b> ‰
Agron, Bed. & Olev. Elec. By  Oleveland City By  Oleveland Electric By	100 100 100	1,000,000 8,000,000 12,000,000	1,000,000 7,600,000 12,000,000	34 % Jan., '59 8-5 % Jan. '99. 34 % Q., Oct., '59.	48 100 87	50 101 £8	United Electric Co. of New Jersey Pittsburg, Pa.—Apr 23: Allegheny Traction Co	1	1 1		2 % Jan 205	55 25 <sup>3</sup> / <sub>8</sub>	25 56
Detroit, Mich.—Apr 23 Detroit Ottisons Street Ry Ft. Wayne & Belle Isle Ry Rapid Railway Co Detroit Electric Railway Wyandotte & Detroit River Ry	100	250,000 1,000,000	1,200,000 250,000 1,000,000	•••••••	100 1/2 175 90	100	Consolidated Traction Copfd.   pCentral Traction Co   gOttisens Traction Co   Touquesne Traction Co   sPittsburg Traction Co   Fedural St. & Pleasant Valley Dr.	50 50 50 50 50	15,000,000 1,500,000 8,000,000 8,000,000 2,500,000	15,000,000 15,000,000 1900,000 18,000,000 1,900,000	2 %, Jan., '96, 8 %, Nov. '98, 13, % Nov. '7, '98, 6 %, A. 8, '%, Nov. 7, '98, 2 %, Aug., '96, 1 %, Oct. '98, 2 %, Aug., '96, 1 %, J. & J. & J. J. & J. J. & J. J. & J. J. & J.	64 1/4 69 10 	25 1/2 74 1/2 71 11
Dayton O.—Awr 23 City Railway Co	100	1,500,000	1,470,600 600,000	1	140 170 114	110 145 115	Pgh., Allegheny & Man. Trac. Co P'ttsourg & Birmingham Trac. Ry Pittsburg & West End Ry United Traction Cocom United Traction Copref.	50 25 50 50 50	1,400,000 8,000,000 8,000,000 1,500,000 17,000,000 8,000,000	1,400,000  2,994,889  8,000,000  1,500,000  17,000 000	2%, X, July, '98. 2%, Aug., '95. 1%, Oct. '98. 5%, A., June 80, 98, J. & J. J. & J.	27 41 14 511/4	29 42% 14% 5 %

\*Unlisted. † Ex div.
a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds. b Leased to Boston Elevated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co. f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR. g Owned by Atlantic Ave. RR and leased to Nassau system.
h \$30 per share on outstanding capital pa'd as rental by leasee—West Ohicago St. RR. Oo.;
250,100 of stock owned by North Chicago Street Railroad Company.
c Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Company.
j 55 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Bailroad Company; 5625,00 of stock owned by Chicago West Division Railway Company; 5% on \$1,000.
Stock guaranted by West Chicago Street Railroad Company.
h Majority of stock owned by Chicago Street Railway Company; 5% on \$1,000.
Chaslanati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

- \*\*Unitsted. † Full paid. | Outstanding. † Ex-div.
  a Leased to New Orleans Traction Company at 8 % on stock.
  b Leased to New Orleans Traction Company at 8 % on stock.
  c Leased to New Orleans Traction Company at 8 % on stock.
  d Operating the former Met. Trac. system, that corporation having become extinct.
  c Leased to Sid Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
  f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway
  g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
  h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.
  i Leased to Metropolitan Street Railway for 18 % on stock
  t Leased to Metropolitan Street Railway for 18 % on stock
  l Leased to Metropolitan Street Railway for 18 % on capital stock.

  I Leased to Metropolitan Street Railway for 18 % on capital stock.
  n Dividends of 1% % yearly guaranteed by Consolidated Traction Company.
  o Controls by lease the Alleg'ny, Cent., Otitzens' Duquesne, Fort Pitt & Pitt'n Traction.
  p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
  g Leased to Consolidated Traction Company for 8 % on eapital stock.
  s Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
  s Leased to Consolidated Traction Company for 4 % on capital stock.

#### 254 ELECTRICITY. [Vol. XVIII., No. 16. PASSENGER RAILWAYS. TELEPHONE AND TELEGRAPH COS. Capital Stock. Bare and Date of Last Div. HAME. Authors'd Issued. Ed. Asked. Par Authors'd Issued. 201. A New Beaford Mass-Apr 28 Boston, Mass. - Apr 23 American Bell Telephone Co.... Erie Telegraph & Telephone Co.... New England Telephone Co..... 100 50,000,000 28,650,000 43, % 2., Jan. 100 ..... 1 % Q., Feb. 20, 10 894,600 10,834,600 \$1.50 p. sh. Feb nion Street Railway Co...... 100 \$850,000 \$850,000 2 %. Peh. 160 165 10434 140 Northampton, Mass-Apr 23 170 178 Northampton Street By ...... 100 200,00 225,000 4 % A., June. New York.-Apr 23; Omaha, Neb.-Apr 23: 94 108 170 52 118 128 118 274 175 5,000,000 65 5,000,000 8 % A. and N. Omaha Street Rv..... 100 Paterson, N. J.-Apr 23 42 112 100 1.950.00 1,250,000 Paterson Bv. Co..... Providence, R. I.—Apr 23 ..... United Traction & Electric Co .... 109 111 8,000,00 8,000,000 % %, Oct. '93 170 2,000,000 1,770,000 2 %, Dec. '59. 1,965,100 1,965,100 2 %, %, July 15, '59. 1588,900 8 % S—July, '99. 75 800,000 80,000,000 29,980,450 8,297,920 80,000,000 1,192,500 89 share Q. 11,875,000 \$14 sha's A—Apr. 59 450 1,000,000 ŸŎ. 24 48 76 76 95 100 814 333 Miscellaneous. - Apr 23: 451 26 188 55 200 148 75 120 124 9414 87 8,561,000 2 % B. 1.000.000 1,000,000 A. & O. 7771,076 \$9 share A, Mar. 98 6,000,000 8 %, A., April, '98. 1572,800 \$5.25 share—1898. 150,000 8 % Jan., 1898. 903 62 210 1.060.000 10,000,000 1,500,000 500,000 750,000 151 152 | 150,000 | 150,000 | 8 % Jan., 1898. | 151 | 150,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 174,000 | 2,000,000 1 % Q 2,500,000 234 % Q 157 ELECTRIO LIGHT AND ELECTRICAL MFQ. 008. 2081 Boston, Mass.-Apr 23: Fort Wayne Electric trust receipts Ft. Wayne Electric trust receipts Ft. Wayne Electric Co. T. Sec. Suries A. fGeneral Electric Co. [old] General Electric Co. [new]..... T.-H. Elec. Co..T. Secur., Series D. Westinghouse Elec. & Mfg. Co. com. Westinghouse El. & Mfg. Co. ptd. Westinghouse El. & Mfg. Oo. assent. 809 20 100 40,000,000 80,450,000 2 % Q., Aug., 1898. 100 18,278,000 18,276,000 1% % Q., Jan., 1900 138% 1385/A 23/4 50 50 146 700 50 4,000,000 50 11,000,000 3,996,058 134 % Q., Jan., '99. Rochester. N. Y.-Apr 23 Rochester Railway Co..... New York -- Apr23: 100 5,000,000 5.000.000 Reading, Pa.-Apr 23 120 9,188,000 4,000,000 7,988,000 2,000,000 1% % Oct. '98. 119 1,000,000 1,000,000 Semi-an.,Jan. & Jy 850,000 1,000,000 Jan., '98. 1,000,000 11,000,000 Jan., '98 12 92 100 8 82 40,000,000 80,460,000 2 % Q., Aug., 1898. 18,276,000 18,276,000 1½ % Q., Jan., 1900. 2,500,000 2,500,000 A. & O st. Louis Mo.-Apr 23 ... 188¾ St. Louis Mo.—Apr 23 Fourth Street & Arsenal Ry. Jefferson Avenue Ry. Co. Lindell Ry. National Rallway Co. Class Avenue & Fair Grounds. Citisens' RR. St. Louis RR. Missouri RR. Pepple's RR. Co. United Electric Ry. United Electric Ry. United Electric Ry. United Electric Ry. United Electric Ry. St. Louis & Suburban Ry. Union Depot RR. 150,000 400,000 2 % Dec., 1888. 2,400,000 1½ % Jan., '99. 2,500,000 4 % Oct., '98. 2,000,000 2½ % Jan., '99. 300,000 50c., Dec., '89. 500,000 3 %, Jan., '99. 2,500,000 3 %, Jan., '99. 2,500,000 3 %, Jan., '99. 4,000,000 8 % A., July. '1 50 50 100 110 23 85 90 125 Pittsburg, Pa.-Apr 23 Allegheny County Light Co..... East End Electric Light Co...... 172 100 100 50 50 50 100 100 Philadelphia, Pa.-Apr 28 \*Electric Storage Battery Co...com. \*Electric Storage Battery Co...ptd. Northern Elec. Light & Power Co.. Southern Elec. Light & Power Co.. 100 2.000.00 144% 80 % 92 % 18 % 80 68 550 000 13 187.500 187,500 4,000,000 8 % A., July, '19 Southern Elec. Light & Power Co... Miscellaneous.—Apr 23. Bridgeport (Conn.) Elec. Lt. Oo... Missouri-Edison (St. Louis)....com Eddy Electric Mfg. Co... Hartford (Conn.) Elec. Light Co... New Haven (Conn.) Elec. Lt. Cc... New Haven (Conn.) Elec. Lt. Cc... Narraganestt (Prov., R.I.) Elec. Co. Bhode Island Elec. Protec. Co... Royal Elec. Co. (Montreal)... Toronto (Canada) Elec. Light Co... Thomson-Houston Welding Co.... Woonsocket (R. I.) Electric Co... fon Aug. 17 last by a majority vo... 4.000.000 San Francisco, Cal.—Apr. 500,000 119 500,000 50c, monthly. 575,000 \$2.50 share, '96. 18,750,000 \$2., 60c, per share 1,000,000 1,000,000 71 15% 9 150 850,000 175,000 100,000 1,200,000 100 25 100 151 10 1.000.000 .... Scranton Pa -Apr 23 100 2 % Q., Oot. 50 100 .... 16% 1,085,000 1% Q 8 % 8, D 500,000 1,050,000 1,000,000 500,000 1,050,000 181% 1,085,000 1821 Springfield Ill-Apr 23 †On Aug. 17 last by a majority vote of the stockholders the capital stock was red to \$20,827,200, of which \$18,276,000 is common and \$2,551,200 preferred. [Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent pany, the Municipal Electric Light Co. Springfield Consolidated By 100 750,000 750,000 Springfield O.-Apr 23 Springfield Street By...... 100 1,000,000 1,000,000 11 Springfield, Mass.-Apr 23 ALLIED INDUSTRIES. pringfield Street Ry..... 1,166,700 8 % A 100 1.200.000 207 212 Toronto Canada.-Apr 23 Roston Mass.-Apr 23 Toronto Street By...... Montreal Street Bailway Co..... 100 6,000,000 1% % B 4,000,000 4 % B 99 261¾ 500,000 72% 98 J. & J. J. & J. 200,000 Washington, D. C.-Apr 23 10,000,000 4,500,000 1,248,700 \$2 p. sn. Jan. 26, '99 1,000,000 \$8.50 p.sh. Nov '9, 50 500,000 500,000 500,000 500,000 500,000 500,000 650 100 106 107 New York.-Apr 23: 40 16 Consolidated Electric Storage Co... Safety Car Heating & Lighting Co... Worthington Pump Co.....oom. Worthington Pump Co.....pfd 100 12 150 5,500,000 2,000,000 5,500,000 2,000,000 100 4 A 110 Worcester, Mass.-Apr 23 8,000,000 2,000,000 550,000 8,000,000 ....... 2,000,000 8 % S., Feb., '98. 542,500 4% %, 1897. \*Worcester Traction Co....... om. Wercester Traction Co...... % pfd. Wercester & Suburban Street Ry... 81 1085 Philadelphia Pa.-Apr 28 100 100 Finauciphia Fa. Apr 20 Electro Pneumatic Trans. Co..... United Gas Improvement Co...scrip. Welsbach Commercial Co....com. Welsbach Commercial Co....pfd. Welsbach Light Co... Welsbach Light Co., Canada. 1,500,000 10,000,000 8,500,000 500,000 625,100 500,000 24 2¼ 1**62** 50 100 100 Wilkesbarre, Pa.-Apr 23 16 XQ 65 481/4 15/4 Wilkesbarre & Wyoming Val. Trac.. | 100 | 5,000,000 | 5,000,000 | 1%, Jan. \*Unlisted. † Paid in. ‡ Full paid. | Outstanding. ‡ Ex-div. a Lessed to Hestonville, Man & Fairmount Passenger Ry, for 6 % on stock per annum b Consolidation Electric, People's and Philadelphia Traction companies. Fixed sharges and all indebtedness of constituent and leased companies assumed by Union Traction Company. c Practically all shares owned by Union Traction Company. d Lessed to Frankford & Southwark Passenger Ry, assumed by Electric Traction Co. c Lessed to Electric Traction Company. f Controlled by Frankford & Southwark Passenger Railway. g Lessed to People's Passenger Railway at \$5 per share. h Majority of stock owned by People's Traction Company. f Lessed to Union Traction Company. f Lessed to Union Traction Company. f Lessed to United Traction Company at a rental of \$10,000 per annum in 1866-7-8 p.a. \$20,000 in 1899-1900 and \$30,000 per annum thereafter, payable semi-annually, rental, declared as a dividend semi-annually. Dividend of 6 % guaranteed by Reading Traction Company. Dividend of 6 % guaranteed by Reading Traction Company. Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co. \*United Co. Welsbach Light Co. Welsbach Light Co. Welsbach Light Co. Welsbach Light Co. Welsbach Light Co. Welsbach Light Co. Welsbach Light Co. Welsbach Light Co. Welsbach Light Co. Welsbach Light Co. Welsbach Light Co. Welsbach Light Co. Welsbach Light Co. Pittsburg. Pa.—Apr 23: Oarborundum Mfg. Co. Standard Underground Oable Co. Standard Underground Oable Co. Standard Underground Oable Co. Standard Underground Oable Co. Standard Underground Oable Co. Standard Underground Oable Co. Standard Underground Oable Co. Standard Underground Oable Co. Standard Underground Oable Co. Standard Underground Oable Co. Standard Underground Oable Co. Standard Underground Oable Co. Standard Underground Oable Co. Oarborundum Mfg. Co. Oarborundum Mfg. Co. Oarborundum Mfg. Co. Oarborundum Mfg. Co. Oarborundum Mfg. Co. Oarborundum Mfg. Co. Oarborundum Mfg. Co. Oarborundum Mfg. Co. Oarborundum Mfg. Co. Oarborund 481/2 100 106 200,000 200,000 175 180 Q 143 102 82 55 105 4 18

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# BONDS.

PASSENGER RAILWAY.					PASSENGER RAILWAY.					_	_		
	Amot	int.		Interest				Amo			Interest		
NAME.	Authorized.	Issued.	Due	periods.	Bid.	Asked.	RADL	Authorized.	Issued.	Due	periods.	Bid.	Δel
Albany N. Y.							New Orleans La. Date of Quotation-Apr 28, 1900.		EST				
Date of Quotation-Apr 23, 1900							Canal & Claiborne RR cons mtg. 6s. Crescent City RR			1899	M. & N.	1051/4	1
he Albany Ry. CoCons. mtg. 5s. he Albany Ry. CoGen. mtg. 5s.	750,000	427,500 875,000	1947	M. & N.	*117	1001	Orescent City RRCons. mtg. g. 5s. New Orleans City RR1st mtg. 6s.	5,000,000 416,500		1908	J. & D.	108	1
Vatervleit Turnpike & RR. 1st mtg. 5s Vatervleit Turnpike & RR2d mtg. 5s.	850,000 150,000		1919	M. & N.	*125 *128 *116½	127½ 127	N. Orleans & Carrollton RR.2d mtg. g. 5s.	850,000	850,000	1907	J. & J. F. & A.	112	1
oy City Railway Cost 5s		****	1942	*****	*110%2	******	Orleans Railroad CoCons. mtg. 6s.	800,000 800,000	800,000 75,000	1906	J. & J. J. & D		
Interest guar, by Albany Ry. Co. Principal and interest guar, by							†\$428,500 in escrow to retire New Or- leans City RR. Co.'s 1st mtg. bonds. 1890,000 outstanding.						
Baltimore Md.							New York.						
Date of Quotation-Apr 23, 1900							Date of Quotation—Apr 23, 1900. Atlantic Ave. (Brooklyn)lmp. g. 5s.	1,500,000	1,500,000	1984	J. & J.	98	
nited Electric Ry. Colst mtg. g. 4s.	88,000,000 14,000,000	18,000,000	1949	J. & D.	102 748/4	1021/4	Atlantic Av. (Brooklyn). 1st gen. mtg.5s. †Atlantic Av. (Brooklyn). Cons. mtg. 5s.	759,000 8,000,000	1,966,000	1931	M. & S. A. & O.	1071/6	
altimore City Pass, Ry1st mtg. g. 5s. altimore Traction Co1st mtg. 5s.	2,000,000 1,500,000 1,250,000	1,500,000 1,250,000	1929	M. & N. M. & N.	1187/8 119 1043/6	120	Broadway & 7th Ave. 1st cons. mtg. g. 5s. Broadway & 7th Ave 1st mtg. 5s.	1,500,000	7,650,000 1,500,000 500,000	1904	J. & D.	128 104 108	
altimore Trac. Co.Exten. & Imp. g. 68, al. Trac. Co.No. Balto div.1st mtg. g. 58	1,750,000 750,000	1,750,000	1942	J. & D.	121	121%	Broadway & 7th Ave2d mtg. 5s. Broadway Surface1st mtg. 5s.	1,120,000	1,125,000 1,000,000	1924	******	115 105	
al. Trac. Co. Coll. Trust, 1st mtg. g. 5s. altimore Traction Co. Convertible 5s. entral Pass. Ry. Co1st mtg. 6s	800,000 96,000	117,000	1906	N. & M.	1021/2		Broadway Surface2d mtg. 5s. Brooklyn City RR. Co1st cons. mtg. 5s. Brooklyn City & Newtown1st mtg. 5s.	6,000,000	6,000,000 2,000,000	1941	J. & J.	116	
entral Pass. Ry. Co. Cons. mtg. g. 5s. ity & Suburban Ry lst mtg. g. 5s.	601,000 8,000,000	580,000 8,000,000	1932	M. & N.	119	121 117	Brooklyn Bath & W.E. RR.Gen.mtg.5s. Brooklyn Heights RRlst.mtg.5s.	1,000,000	448,000 250,000	1983 1941	J. & J. A. & O.	101 104	
ake Roland Elev.,lst mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117		Brooklyn, Q's Co. & Sub'n1st mtg 5s. Brooklyn, Q's Co. & Sub'n1st cons. 5s.	4,500,000	8,500,000 2,750,000	1941	M. & N.	112 107	1
All of the bonds of the above mpanies, marked t, have been as-							Bleecker St. & Fult'n Fer'v RR. 1st mtg. 7s	700,000	5,181,000 700,000	1900		101%	1
med by the United Railways & Elec- c Company.							Central Crosstown RR1st mtg. 4s.	200,000	1,200,000 250,000 800,000	1922	J. & D. M. & N. J. & J.	107 125 101	
Boston, Mass.  Date of Quotation—Apr 23, 1900.							Coney Island & Brooklyn RR. Ist mtg.5s 2D. Dock, E. Bd'y & Bat'y R. gen. mtg. g.5s Dry Dock, E. Bd'y & Bat'y RRscrip 5 %.	. 100,000	980,000	1932 1914	J. & D. F. & A.	102	
ynn & Boston RRlst mtg. g. 5s. est End Street RyDeben. g. 5s.	5,879,000 8,000,000	8,702,000	11902	M.ALN.	114	115 106	Eighth Av. RR. CoCert. indebt. 6 %. 42d St., Man. & St. Nich. Avlst mtg. 6s.	000 000	1,000,000	1914 1910	F. & A. M. & S.	108	
set End Street RyDeben. g. 41/28. \$1,674,000 in escrow to retire outstand-	2,000,000	2,000,000	1914	M. & S.	112		Lex. Ave. & Pav. Ferry RR.1st mtg. g.5s.	5,000,000	1,500,000 5,000,000	1993	M. & S.	89 124	
bonds of absorbed companies							Metropolitan St Ry Cog. m. cl. tr. g. 5s Second Avenue Ry. Gen. cons. mtg. 5s.	1,600,000	1,600,000	1909	M. & N.	120	1
Charleston S. C.  Bate of Quotation— Apr 23, 1900.							Second Avenue RyDeb. 5s. Steinway Ry. (L. I.)lst mtg. g. 6s.	1,500,000	800,000 1,500,000 850,000	1922	J. & J.	178% 116 110%	
nterprise Street RR	500,000 850,000	47,000		J. & J. J. & J.	106		South Ferry RR. Co	5,000,000	5,000,000	1987	J. & J. J. & J.		
Controlled by Charleston St. Ry .Co.	800,000			0.00			Twenty-third Street RyDeb. 58 Union (Huckleberry) Ry1st mtg. 58.	150,000	150,000 2,000,000	1906 1942	J. & J. F. & A	106 118	
Chicago III.							### The state of t	500,000	500,000	1948	J. & J.	110	
Date of Quotation—Apr 23, 1900, hicago City Ry	6,000,000	4,619,500	1901	J. & J.	1013/4	21/4	\$4,850,000 in escrow to retire maturing						
hicago Passenger Rylst mtg. 6s. hicago Passenger RyCons. mtg. 6s.	1,000,000	600,000	1929	F. & A. J. & D.		102	obligations. §\$552,000 in escrow to retire 1st and 2d						l
hicago & So. Side R. Tlst mtg. g. 5s. icago & So. Side R. T	7,500,000 1,500,000	7,500,000	1907	J. & J.	1081/2	100	mtg. bonds.  §In treasury, \$80,000.  †† Guar. by Union By. Oo.	-					l
hicago West Div. Rylst mtg 4½8, ke Street Elevated RRlst mtg. g. 58. strop. W. Side Elev. Rylst mtg. g. 58.	4,040,000 7,574,000 15,000,000	4,040,000 8,781,200 15,000,000	1928	J. & J.	96	96%	Toronto Canada.						-
orth Chicago St. RRlst mtg. 5s. orth Chicago St. RRCert. indeb. 6s.	8,171,000 500,000	8,171,000	1906	J. & J. J. & J.	106		Date of Quotation-Apr 23, 1900.  Montreal St. Bylst mtg. 5s.	2,500,000	800,000		M. & S.		
orth Chicago City Rylst mtg. 6s. orth Chicago City Ryconsol. 41/8s.	500,000 2,500,000	2,500,000	1900	J. & J. M. & N.	108		†Toronto St. Rylst mtg. g. 4½s. †\$85,000 per m. single track authorized.	4,550,000	2,200,000	1921	M & 8		
est Chicago St. RR 1st mtg. 5s. ost Chicago St. RR Deben, 6s	4,100,000 2,700,000	8,969,000	1928 1911	M. & N. J. & D.	101	111 102	\$600,000 in escrow to retire 6s due in 1901.			-			
. Ohicago St. RR. Tunnel 1st mtg. 5s.	1,500,000 1,500,000	6,000,000 1,500,000	1986		1065/8	107	Philadelphia.  Date of Quotation—Apr 23, 1900						
Redeemable at option on 60 da. notice. Funded debt assumed by Chicago W.							Continental Pass. Rylst. mtg. 6s Empire Pass. Rylst mtg. 7s	850,000 800,000	810,000	1909 1900	J. & J. J, & J.	••••	
v. Ry. Co., controlling interest of nich is owned by W. Chicago St. RR. ., lessee.							Greene & Coates St. Ry	100,000	100,000	1901	J. & J.		
Subject to call after Oct. 1, 1899, at 0 and interest.							People's Pass. Rylst mtg. 7s People's Pass. Ry2d mtg. 5s	250,000 500,000	459,000	1911	J. & J.		
Assumed by W. Chi. RR. Co., lessee. Int. guar. by W. Chicago St. RR. Co.							People's Pass. ByOons. mtg. 5s-	1,125,000 5,698,210	867,000	1912 1948	M. & S.	::::	
Cincinnati, O.							Phila. City Passenger Bylst mtg. 5s. Philadelphia Trac. Co Coll tr. 2 4s.	1.800,000	1,018,000	1917	J& . F.&		
Date of Quotation—Apr 23, 1900.					1101/	11/1/	Thirteenth & 15th St. Rylst mtg. 7s. Union Passenger Rylst mtg. 5s.	500.000	100,000 500,000	1911	A. & O. A. & O. A. & O.		
n. New. & Cov.St. Ry. 1st Con.mtg. g.5s It. Adams & Eden P'k In1st mtg. 6s. It. Adams & Eden P'k In1st mtg. 6s.	46,000	2,500,000 46,000	1900	A. & O.	118½ 108½ 114	114%	West End Passenger By 'st mtg. 7s. West Phila. Pass. By	29,785,000	29,724,876	1905 1906			
4. Adams & Eden P'k Inc. Cons. mig. 58	100,000 581,090 250,000	581,000	1906	A. & O. M. & S. M. & S.	108 <sup>3</sup> / <sub>4</sub> 12i / <sub>9</sub>	1221/2	West. Phila. Pass. By2d mtg. 5s. ? The trust certificates were issued to	750,000	750,000		M. & N.		
Oov. & Cin. St. Rylst mtg. 6s. o. Cov. & Cin. St. Ry2d mtg. 6s. Assumed by the Cincin. St. Ry. Co.	400,000	400,000	1982	J. & J.	1823/4	187	pay for the shares of the Electric and People's Traction lines purchased.						
\$250,000 reserved to retire 1st mtg. bds. Cleveland, O.							Pittsburg, Pa.						
Date of Quotation Apr 23 1900							Date of Quotation—Apr 23 1900 Birmingham, Knox & Allentown6s.	500,000	E00 060	1981	M. & S.	1111/4	
rooklyn Street RR. Colst mtg. 6s. n. New't & Cov. St. Ry. Cons. mtg. 5s.	600,000 8,000,000	500,000	1908	M. & S.	1061/4	107 114 h	Central Traction Co	875,000 1.250,000	500,060 875,000 1,250,000	1980 1927	J. &. J A. & O.		
veland City Cable Rylst. mtg. 5s. eveland Electric Ry.Co. 1st mtg. g. 5s.	2,000,000 8,500,000	2,500,000 2,000,000 1,249,000	1909	J. & J.	105½ 106	106 107	*Duquesne Traction Colst mtg. 5s. *Fed'l St. & Pleas. Val. Jack's Run5s.	1,500,000	1,500,000	1913	J. & J. J. & J.		
umbus (0.) Cent. Rylst mtg. g. 5s. ast Cleveland RRlst mtg. 5s.	1,500,000 1,000,000	1,500,000	1918	M. & N.		1071/2	Fed'l St. & Pleasant ValleyOons. 5s. Millvale, Etna & Sharpsburg5s. Pittsburg, Crafton & Mansfield5s.	1.250.000	1,250,000 750,000	1942 1928	J. & J. M. & N.	110	
Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s. rain (O.) Street Ry 1st mtg. 6s.	600,000 200,000		1922	M. & N. J. & J.	****		Pittsburg Traction Co	750,000	250,000 750,000	1927	J. & J. A. & O.	110	1
Ry. Co., Grand Rapids1st mtg. 5s.	600,000	600,000	1912	J. & D.		• • • •	Pittsburg & Birminghamlst mtg. 5s. Pittsburg & West Endlst mtg. 5s.	500,000	1,500,000 500,000	1922	M. & N. J. & J.	112	1
Interest guar. by Cons. St. Ry. Co.							*Pg'h., Allegh, & ManchGen. mtg. 5s. Second Ave. Traction Co5s, Sub. Bapid Transit Railway Co6s,	1,500,000 2,500,000 500,000	1,400,000 2,000,000	1984	A. & O. J. & D. V & S.		
Detroit, Mich.  Date of Quotation—Apr 28 1900							Providence R. I.	500,000	500,000	14	. a a.		
etroit Citisens' St. Ry1st mtg. 5s. Wayne & Belle Isle Ry1st mtg. 6s.	7,000,000	8,885,000	1905	A. & O.		1021/4							
e Detroit Ry	1,800,000	877,000 1,800,000		A. & O. J.&D.	105	106%		50,000 9,000,000	50,000	1910	J. & D.		1
. Oity Ry. and Grand River St. Ry.							St. Louis.	5,000,000	8,260,000	1988	м. & 8,	114	
Date of Quotation—Apr 23 1:00							Date of Quotation-Apr 23, 1900,						
w Haven St. Ry 1st mtg. g. 5s. w Haven (Edgewood Div.) 1st. mtg. 5s.	600,000 <b>25</b> 0,000	600,000 250,000			111 111		Baden & St. Louis RRlst mtg. 5s. Cass Ave. & Fair Gds Rylst mtg. 5s.	5000,0 <b>0</b> 0 1,600,000	250,000 1,600,000			100	
nehester Avenue RR-lst mtg. g. 5s.	100,000		1	MAN	109		Citizens' Railway Co1st mtg. 5s.	2,000,000	1,500,000	1000	J&J	109	4

FAOOEN		MILWI	<u> </u>	·		
	Amot			Interest		
NABR.	Authorized.	Innued.	Due	periods	Bl4.	A-Red.
St. Louis.  Date of Quotation—Apr 23, 1100.  Jefferson Avenue Ry	1,000,000 125,000 175,000 1,000,000 75,000 2,000,000 2,000,000 300,000 500,000 1,091,000 1,091,000	400,000 1,500,000 800,000 125,000 75,000 900,000 1,400,000 1,400,000 500,000 1,991,000 1,787,000	1910 1902 1902 1904 1906 1900 1921  1909 1918	F. & A. M. & S. A. & O. J. & D. M. & N. J. & J. M. & N. F. & A. M. & N. J. & J.	108 108 108 100  100 99 % 108 80 116 100 121	105 109 102  101 100 × 104 104 108 118 100 × 122
Histon,000 in escrow to retire 1st mtg.  San Francisco Cal.  Date of Quotation—Apr, 1900.  California St. Oable RBlst mtg. 5s. Ferries & Cliff House Rylst mtg. 5s. Geary St., Park & Ocean RR.lst. mtg. 5s. Market St. Cable Ry. Colst mtg. 5s. Metropolitan By. Colst mtg. 6s. Metropolitan By. Colst mtg. 6s. Park & Cliff House RBlst mtg. 6s. Park & Cliff House RBlst mtg. 6s. Park & Ocean RRlst mtg. 6s. Park & Ocean RRlst mtg. 6s. 4uter St. Ry. Colst mtg. 5s. 4Oontrolled by Market St. Ry. Co.  Washington D. C.	1,000,000 650,000 1,000,000 8,000,000 200,000 2,000,000 850,000 250,000 700,000	900,000 650,000 671,000 8,000,000 2,000,000 350,000 700,000 900,000	1914 1921 1918  1918 1912 1914 1912	M. & S. A. & O. J. & J. A. & O. J. & J. J. & J.	114  126½ 126½ 105½ 115	117 117 95  107
Date of Quotation—Apr 23. 1900  Belt Ry. Co	500,000 200,000 500,000	450,000 500,000 200,000 500,000	1911	J. & J. A. & O. J. & D. J. & J.	182	••••
Date of Quotation—Apr 23, 1500 Bridgeport Traction Co	. 5,000,000 14,000,000 8,000,000 8,000,000 15,000,000 4,000,000 4,000,000 6,000,000 5,000,000 5,000,000 1,250,000 1,250,000 1,250,000 1,000,000	1,688,000 8,543,000 2,386,000 2,281,000 18,995,000 572,000 8,800,000 922,000 4,981,000 4,981,000 2,378,000 439,000 1,000,000 4,298,000	1981 1938 1982 1933 1938 1938 1930 1938 1930 1919 1928 1928 1902 1931 1980	F. & A. M. & N. J. & J. J. & D. J. & J. A. & O. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & D. J. & J. J. & D. J. & J. A. & O. J. & J. J. & D. J. & J. &	108 118 104 115 1115 11114 115 20 80 119 1104 108	110 105 118 1118 1165 85 1193 1103 
1\$37,000 in treasury. 1\$960,000 res'ved to redeem orter tiens.						
HA20,000 in escrow.			<u> </u>		*With	int'res
ELEOTRIO LIGHT AN	D ELE	OTRIC	DA	L MF	<u>a.</u> c	908
Boston, Mass  Outs of Quotation—Apr 23 1900.  Delaware Gas Lt. Co.,lst m. 5s, g. Edison Elec. Illuminating Oo., Boston  General Electric Cogold coup, deb. 5s  Pittsburg Pa  Date of Quotation—Apr 23, 1900	10,000,000	800,000 8,750,000	1922		106 157 116	•••••
Allegheny County Light Co 68. A estinghouse Elec. & Mig. Co. Scrip 68.	500,000 195,570		1911	J. & J. M. & B.		
Miscellaneous.—(Apr 23, 1900.) E Hson El. Illg. Oo. (N. York) 1st m. 5s. E Hson El. Illg. Oo. (N. Y.) con. m. 5. 5s. E Hson Electric Light (Philadelphia). E Hson Electric Light (Philadelphia). Kings Co. El. Lt. & Pow. Co. lst mig. 5s. Kings Oo. El. Lt. & Pow. Co. pur. money 5s Milwaukee El. Ry & Lt. Co. lst con. g. 5s. United Elec. Light & Power Oo(N. Y.).	5,000,000 2,000,000 2,500,000 5,176,000 8,000,000	4,812,000 2,188,000 5,000,000 2,500,000 5,176,000 6,103,000	1998	A. & O. A & O.	109 124 1221/2  100 120 102/3	103
TELEPHONE		TELE	⊋R	APH.		_
Miscellaneous.  Date of Quotation—Apr 23 1500  American Bell Telephone			1908		100½  1'4 108	101 115 106
ALLIED	INDU	STRIE	s.			
Miscellaneous.  Date of Quotation—Apr 23, 1100  American Electric Heating	75,000	5 70,000	194 190	j. & J.	106	25 107

PASSENGER RAILWAY.

## NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16%@17%c.; Lake, 17%@17%c.; casting, 16%@17c.

The Hudson River Telephone Company has declared a quarterly dividend of 1½ per cent., payable May 1.

The second installment of \$2.50 per share on Telephone, Telegraph & Cable Company of America stock is payable on May 1.

The Chicago Edison Company has declared a regular quarterly dividend of 2 per cent., payable May 1. Books closed April 23 and reopen May 1.

A deal is under way for the merger of the Consolidated Gas Company of Balti-more and the United Bailways and Electric Company of the same city.

The United Electric Securities Company of Boston has declared a regular semi-annual dividend of \$3.5) on preferred stock, payable May 1 to stock of record April

A member of the General Electric Automobile stockholders' committee is reported as saying that enough stock has been deposited to assure the carrying out of the idea to reorganize the company.

In well-informed financial houses it is the impression that the Western Union Telegraph Company will pay its next regular dividend at the usual rate, but that at the next succeeding quarterly dividend period the rate will be reduced.

The Western Union Telegraph Company has completed arrangements for extending \$500,000 five per cent. bonds of the Gold & Stock Telegraph Company for five years from May 1, 1900, at 4½ per cent. The bonds originally were 6s.

The Brooklyn & Rocksway Boach Railroad Company reports for the quarter ended March 31 a deficit after fixed charges of \$5,234, against a deficit last year of \$4 615. The general balance sheet shows cash on hand \$1,110 and a profit and less deficiency of \$51,787

The Consolidated Electric Company has filed papers with the Secretary of State at Trenton, N. J., increasing its capital from \$100,000 to \$4,000,000. The articles were signed by William F. Eidell, president, and C. W. Gouert of Philadelphia, secretary.

The Chicago Edison Company for the year ended March 31, 1900, reports: Gross income, \$2,133,827, increase, \$178,950; net income, \$812,390, increase, \$72,134; interest on bonds, \$265,243, increase, \$2,719; balance, \$547,147; increase, \$69,415; dividends, \$398,072.

The latest quotations for some of the new industrial stocks, not given elsewhere, s: Electric Boat, 25(2): New York Electric Vehicle Transportation, 12(2): w England Transportation, 5½(2): Telephone & Telegraph Company of America 37(4)4; Gramophone, 48(42.

The Albany Railway Company has filed its last quarterly report as a separate corporation. The new consolidated company, of which it is a part, the United Traction Company, has declared a quarterly dividend of 1½ per cent. This is the first dividend of the new company.

On petition of stockholders, Justice Davy, at Lyons, N. Y., appointed Edward Moir temporary receiver of the Clyde Gas and Electric Company. The capital is \$40,000; assets, \$59,000; liabilities, \$61,159. The plant was bonded by the Trust and Deposit Company of Onondags, N. Y., for \$25,000.

A syndicate of ten New York capitalists is said to be formulating a plan for a trunk telephone line from Biston to Chicago with \$50,000,000 back of the plan. An effort will be made to purchase the New England Telephone & Telegraph Company and part of the American Bell system. The proposed rate from Boston to Chicago is \$2.

Work is to begin on Lung Landth, and the landth of the American Bell system.

Work is to begin on June 1 on the new Buffalo, Rochester and Niagara Falls Electric Railroad. Tais road will be about 129 miles in length, which makes it the longest suburban electric line known. Ex-Sacretary of State Allen C. Beach is to be president of the company; ex-Congressman Charles S. Baker of Rochester, vice-president, and William H. Gillette, superintendent.

A dispatch received yesterday from Chicago says that the continued weakness in National Carbon Company stock is attributed to the statement that that company will not only have to compete with the Consumers' Carbon Company, which was organized at Lancaster, O. Saturday, but also with the Spear Carbon Company, at St. Mary's, O., which is reported to be preparing to make all kinds of light carbons and electrodes.

A \$5,000,000 mortguge, made by the Standard Electric Company of California to the Mercantile Trust Company of New York, was recently filed for record in the Recorder's office of San Mateo County. The mortgage covers all real and personal property of the Standard Electric Company, including all its plants, wires, circuits, poles, etc., now used as well as all property, both real and personal, to be hereafter acquired by said company.

Arthur H. Masten, the standing master appointed by Judge Lacombe to pass upon the advisability of issuing receiver's certificates for the Third Avenue Railroad of New York, gave another hearing to the creditors and others interested last week. It was the consensus of opinion that the reorganization of the Third Avenue Railroad was progressing favorably, and that nothing should be done pending the ratification of the lease of the Third Avenue to the Metropolitian Street Railway Company. The hearing was adjourned without action to May 22.

way Company. The hearing was adjourned without action to May 22.

At a recent meeting in this city, the directors of the New York Telephone Company voted to increase the capital stock from \$16,000,000 to \$3,000,000. At this same meeting the question of providing funds for the floating indebtedness of the Southern Bell Telephone Company of \$2,000,000 was also considered. This company is owned jointly by the American Bell Telephone Company and the Western Union Telegraph Company. It is quite probable that an increase of the capital stock will be made in the near future to provide funds to pay off the floating debt and extend the lines of the company in the seven Southern States in which it operates.

The United Railways and Electric Company of Baltimore has sold \$3,000,000 The United Kallways and Electric Company of Baltimore has sold \$5,000,000 of its 4 per cent, bonds to Alexander Brown & Sons. These bonds have been resold by the purchasers to various financial institutions with the agreement that they are not to be offered on the market within six months, and then at not less than par and interest. It is said that the bonds were purchased at 95 and interest. With the money thus secured the company pays off all its floating debt incurred for new equipment, extension of power houses, erection of shops and other requirements in sight for the next year or more. It also applies \$750,000 to the payment of a loan made to supply each to pay off collatoral trust bonds which were paid when they made to supply cash to pay off collateral trust bonds, which were paid when they matured January 1.

Reports that have been in circulation to the effect that the \$7,000,000 increase of the Metropolitan Street Railway was to provide the funds for the purchase of Third Avenue Railroad stock have been authoritatively denied. "The increasing of our capital, as anticipated." President Vreeland is reported as saying, "is to provide the wherewithal to carry out several plans that I suggested for the improvement of our service. At the present time we are pushing to completion work that has been under way for several months." The meeting of the Metropolitan stockholders, to vote on the increase of stock is called for May 17, at which time also the stockholders will be called upon to ratify the purchase of control of the Third Avenue Railroad and its allied companies. The increase of the capital by \$7,000,000 will bring up the total of Metropolitan stock outstanding from \$45,000,000 to \$52,000,000. 000,000.

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# FLECTRICITY

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## EDITORIAL NOTES.

#### The General Electric Company's Eighth Annual Report.

Elsewhere in this issue will be found in full the Eighth Annual Report of the General Electric Company. This report

shows gross receipts for the year ended January 31, of \$23,248,170.45, as compared with \$16,472,-021.68 for the year ended January 31, 1899, or a gain of \$6,776,148.77. Of the total amount taken in there was a net profit of \$5,479,130.20, as compared with \$2,584,896.61 the previous year. The sum of \$1,282,670.67 was paid in dividends on the preferred and common stocks, \$281,666.67 of this amount however being interest on outstanding debentures.

The report shows the capital liabilities of the General Electric Company to be—common stock \$18,276,000, preferred stock \$2,551,200 and debentures \$5,300,000, making a total of \$26,127,200.

It is interesting and gratifying to note that the patent account, which was carried at \$8,000,000 two years ago and which was reduced to \$4,000,000 in the Seventh Annual Report, has again been cut in half and is now carried at \$2,000,000. This is as it should be and is probably a fair estimate of the value of the patents, and franchises owned by the company.

The annual meeting of the stockholders will be held in the office of the company on Tuesday, May 8, at 12 m. The transfer books, which closed April 14, will be re-opened Wednesday, May 9.

New York City and the Garbage Question. The Anti-Barren Island Nuisance Bill has been signed by Governor Roosevelt. This

bill provides that the offensive trades carried on within the limits of Barren Island shall be discontinued inside of a year. This means that New York City will have to seek some other method of disposing of its garbage, and such being the case it might be well for the local authorities to examine carefully into the system extensively made use of in England, with a view to adapting it to the conditions existing in this metropolis. The system we refer to is that employed at Shoreditch, a vestry of London, at Oldham, Ealing, Liverpool and many other places. In these plants all the refuse collected serves as fuel and is made to generate

steam for operating dynamos, the current from which is utilized for lighting and power purposes. Generally speaking a plant consists of a destructor house, which contains a number of cells or small furnaces into which the refuse is dumped. A forced draft is frequently employed to stimulate combustion, the obnoxious gases passing out of the front of each cell and through the boilers before effecting their escape to the atmosphere. As previously stated, the steam produced by this low-grade fuel is in most cases used to generate electricity for lighting or other purposes. A steady feeding of the refuse would naturally generate a steady amount of steam, whereas the demand for power would of course be irregular, a far greater amount being required at night than during the day. To overcome this difficulty two methods are employed. One consists in making use of storage batteries for storing the surplus current while the other is the Halpin storage system, an ingenious arrangement for storing steam, which was described in detail in the issue of Electricity of December 22, 1897.

The garbage destructor plants in Great Britain have apparently given satisfaction and have accomplished that for which they were designed, although according to the best advices they have not been, strictly speaking, money making enterprises. They have been the means however of getting rid of all kinds of garbage and refuse in an unobjectionable and sanitary manner, at the same time furnishing sufficient power to light all the streets from which this low grade fuel is collected.

Many claim that plants of this description could not be made to work satisfactorily in this country owing to the greater amount of moisture present in the garbage, and that consequently they would prove most dismal failures. Admitting that the refuse collected in New York City would prove inferior as fuel to that collected in England, it would simply mean that the profits in the undertaking would be less. According to a recognized authority, however, ordinary ash-bin refuse in this country has a calorific value equal to about one-fifth that of ordinary coal. Assuming a population of 2,500,000 for New York City, the amount of refuse would amount approximately to 5,000,000 tons a year, which according to the authority mentioned would be equivalent to 1,000,000 tons of coal. Of course this is a theoretical figure, and the same amount of power could probably not be derived in practice from 5,000,000 tons of refuse that could be from onefifth that amount of coal, but nevertheless it goes to show that refuse has a certain caloritic value. Such being the case and in view of the fairly good results obtained in England it certainly behooves the authorities of this city, now that a change has to be made, to examine carefully into this method of garbage disposal before deciding on some other method that may ultimately prove as objectionable as the Barren Island scheme.

#### \* \* \*

London Waking Up. An article in the Washington "Star" by its London correspondent, will lead one to believe that the English

metropolis is waking up and emerging from that state of conservatism and lethargy that has enthralled it for many years. After referring to the fact that municipal or public ownership is about to be given a trial on an immense scale in that city the article says:

"In the course of a few weeks the first electric street car to run in London will make the journey from Westminster bridge to Tooting, and from that time electricity will supersede the horse on the line between those classic localities. This is only preliminary to a project on the part of the city of Londonwhich owns this line-to make the same change on all the sixty-eight miles of "tram lines," as they are called, which the city not only owns, but manages, a change which it is estimated will cost in the neighborhood of \$15,000,000. Parliament's consent to this transaction will be asked by the London county council in the course of the present session, and as soon as it is obtained—for there is no doubt that it will be-the work will be undertaken."

But it is not alone its street railways that London proposes to improve, but its telephone service as well Parliament has taken action on that vexed question, which has caused so much discussion in English publications in the past, with the result that the death-knell of the National Telephone Company has probably been sounded. An appropriation of \$10,000,000 has been made for a system to be built and operated by the Post Office. This decision was reached, according to the writer referred to, as follows:

"Wind has played hob with the National Telephone Company's service all through the past year, and only a little while after the passage of that bill through Parliament it asked permission of the London county council to lay its wires underground. It was told that it could if it would consent to work some reforms in its present ragged system and abate its prices to a more reasonable figure. It was when it refused to do this that the council decided to lay an underground system of its own. In the capacity of manager, the city of London will charge \$15 for installation as compared with the \$75 charged by the trust, and make a proportionately lower rate for public call offices."

Now that London is practically assured in the near future of an up-to-date system of screet railways and good telephone service, it might be in place for a Member of Parliament seeking distinction to arise and protest against the alleged inefficient street lights, regarding which the English daily papers have had so much to say of late. Then after the light question has been satisfactorily disposed of, let Parliament appropriate a sum of money for the purchase of a large number of the electrical fog dissipators, which were talked of

a year or two ago, and London will be an ideal electrically-equipped city, and in every way up-to-date.

\* \* \*

An Automobile Stage Service for New York City. A bill recently became a law in this State that will ultimately have much to do with the convenience

of the traveling public of New York City. Some time ago a movement was made to substitute electrically-propelled automobiles for the old lumbering stage coaches which had been plying up and down Fifth avenue for the past decade. This change of affairs was brought about by well known local capitalists, who purchased the old Fifth avenue line. The bill to which the Governor of New York has just attached his signature, is entitled "An act to amend the transportation corporation's law by the addition of a new section in relation to existing routes and extensions." It authorizes any corporation that has operated a stage route continuously for five years last past, in any city of the first class (New York or Buffalo) to extend its routes in any direction without further authority than the approval of the State Railroad Commissioners.

That this law was enacted in the interest of the Fifth Avenue Coach Company, which is, as is well known, controlled by the New York Electric Vehicle Company, is conceded, as the former organization is the only one in this city to which the provisions of the new law could possibly apply.

In the course of time it is said to be the purpose of the gentlemen back of this enterprise-who are also prime movers in the Metropolitan Street Railway Company-so to operate this automobile line that it will supplement the transportation facilities furnished by the street railway company. With this object in view-after perfecting the service on Fifth avenue—double deck automobiles will be run through much frequented highways not supplied with street car lines. The routes to be laid out under authority of the new law will include a number of cross-town streets, such as Sixty-fifth, Seventy-ninth and Ninetysixth. Arrangements will also be made to furnish transportation facilities to persons living on the west side of town at considerable distance from any of the surface or elevated lines, as for instance the residents of West End avenue and Riverside Drive. When this automobile stage service is inaugurated the fare charged will it is expected be ten cents for each passenger, and according to the law the company must pay a license fee to the city equal to the charges now in force for licensing similar stages and omnibuses, and it must also pay to the Comptroller of the city 5 per cent. per annum of its gross receipts.

That an automobile stage service in this city, such as that contemplated, should prove a great convenience to the traveling public there is not the slightest doubt, and it is therefore to be hoped the near future will find it a reality.

A REPORT has been received at the British Embassy at Washington from the home Government in which it is stated that the following ships will be under construction for the British Navy in the course of this year: Seventeen battleships, 20 armored cruisers, 1 first-class protected cruiser, 2 second-class protected cruisers, 1 third-class cruiser, 8 sloops, 2 light draft gun boats, 4 torpedo boats, 21 torpedo

boat destroyers. Regarding wireless telegraphy the report says: "The Marconi system of wireless telegraphy was tried in the naval manœuvres of 1899, and proved very successful so long as only one ship was signaling. Signals were taken in successfully at a distance of sixty miles. Negotiations have been carried on between the British Government and the Marconi Company, but the question of terms has not yet been settled. In the meanwhile the Admiralty are endeavoring to procure for further and more extended trials some more installations of wireless telegraphy, both from the Marconi Company and from other sources."

## UNDER THE SEARCHLIGHT.

#### Notes and Comments on Various Topics.

The electrical contractors of the United States will hold a convention in this city about September 1. This selection was made because most of the supply houses of the association are located here.

A DISPATCH from abroad states that a Franco-Belgian syndicate proposes to establish an electric tram line between Brussels and Paris, the run to be made in two hours.

Almost all the towns in Siberia are having are lights for street use and incandescent lights for houses, and it is claimed the larger proportion of the people in Siberia have never seen gas, which they regard as an illuminant of a past age.

THE new trolley road between Hazleton and Wilkes-Barre, Pa., will have some novel features. A steam engine to haul freight between the cities is one departure. Another will be a through electric express car from Hazleton to the county seat that will have a maximum speed of a mile a minute, and make the trip in less than an hour.

Consul Thackara at Havre reports to the State Department at Washington, that a new submarine telegraphic cable, 81.3 knots in length, has been laid between Havre and Cuckmen, near Beachy Head, England, by the steamship Britannia for the Anglo-American Telgraph Company. The land connections in England and France will be completed in a short time. When the new cable is connected with the London wire, use of the Brest cable will be discontinued.

At the seventh annual exhibition of the New York Academy of Sciences, held in the American Museum of Natural History, Columbia University was represented by a series of remarkable astronomical photographs. There was an interesting collection of microscopes, Electrical progress was shown by many models. In the realm of photography there were pictures of moving trains taken with an exposure of 1-500 part of a second.

An automobile, which is to displace mules on the towpaths, was tested last week on the banks of the Delaware and Raritan Canal near Trenton in the presence of several officials of the canal company. The automobile towed a hundred-ton boat at a rate of three miles an hour for a stretch of several miles.

THE electric ambulance for St. Vincent's Hospital, New York City, is now completed and is a most handsome vehicle. It is steered by the front wheels, with two two-horse-power motors driving it. Solid rubber tires are used and a rawhide gearing to lessen the noise of the



machinery. The interior is lighted by a tencandle power electric light.

THE Northern Pacific Company has installed its new electric pump about a mile east of Mandan, N. D., power to which is conveyed on wires. The pump is run by a 20-horse-power electric motor, and it works smoothly. Locomotive engineers who are using the water from the new well state that it is better and clearer than the Missouri River water taken from the Bismarck standpipe. The Bismarck water is pumped from the river and then allowed to settle in the large receivers of the Bismarck Water Company. The water now being used by the railroad from its new well is Missouri River water, filtered through about half a mile of sand that separates the well from the river.

THE annual meeting of the National Academy of Sciences at Washington, D. C., was recently brought to a close with the announcement of the award of the Barnard medal to Wilhelm Conrad Roentgen, the discoverer of the X-rays. The medal is presented only once in five years, and is given to the person making the most important scientific discovery during that period. The award was unanimously approved by the members. Three papers were read, two by Mr. Reginald Fessenden, who considered technical points relating to electric motors, and spoke on the physical properties of pure metals, and the third by Mr. F. W. Putnam, who gave an account of human bones found near Trenton, N. J., in glacial deposits. The next stated meeting of the Academy will be held at Providence, R. I., December 13, 1901.

THE generating plant of the Colorado Electric Power Company is situated in Canon City, Col., with an abundant water supply, and no difficulty to contend with in regard to procuring coal, located as it is near large coal fields, and exempt from the trials of snow-bound roads which a mountainous country is afflicted with. In the Cripple Creek district about 100 mines get their power from the electric wires, which the company has strung into camp, and six mills also run by this means. They are saved all the petty annoyances that come to those using steam, such as the freezing of the pipes. as well as the dependency on water and coal; and the fact that this plant is located outside of the mountains gives it an advantage over the local electric works, as the latter is as dependent for water and fuel as are the mines.

CONSUL BORDEWICH sends from Christiania Norway, the programme of the permanent machinery exhibition which has been opened in that city. Manufacturers, agents and other interested parties are invited to exhibit. The metal, wood-working, spinning and weaving industries will be represented, as well as works in paper, leather, rubber, clothing, etc.; also engines. The programme sets forth that machinery, tools, etc., can be exhibited at a low rent in centrally situated rooms. Appliances can be shown in operation without extra expense for driving power. New and patented machinery and appliances may be exhibited and advertised cheaply and effectively. Catalogues of the exhibition will be distributed without extra expense to the exhibitors. Mr. Bordewich advises that new inventions, should be patented in that country before they are shown. Application for patent in Norway should be made within six months after patent is granted in the United States.

# General Electric's Eighth Annual Report.

## Statements of the President, First, Second and Third Vice-Presidents.

#### **RESULTS OF THE PAST YEAR'S BUSINESS.**

The following is the full text of the General Electric Company's Eighth Annual Reportfor the year ending January 31, 1900:

#### PRESIDENT'S REPORT.

SCHENECTADY, N. Y., April 21, 1900. To the Stockholders of the General Electric Company:

During the past year there has been a rapid growth of confidence in the securities issued by Electric Railway, Illuminating and Power Companies, and a greatly increased investment demand therefor.

The result of this employment of new capital in such enterprises has been to stimulate the production of that class of electrical apparatus to the manufacture of which the factories of the General Electric Company have been largely devoted.

Apart from the activity in such fields, the rapid adoption of electricity for operating all kinds of machinery, its application in naval and marine service, and to chemical uses, and the introduction of electric street vehicles, have resulted in the design and manufacture of many new electrical appliances by your company. Meanwhile the demand for those motors, lamps and general supplies, which have long been standard with your company, has been well maintained.

There are appended hereto reports of the First, Second and Third Vice-Presidents, covering matters of interest in the several departments under their charge.

Your careful attention is invited to the complete and detailed information given there-

Reduction in patent account.....

Net addition to surplus account ......\$2,196,459.58

While the results of the year's business have in general been satisfactory, the wide fluctuations in the values of raw material have created much disturbance and increased the difficulties in estimating costs and in fixing prices.

Because of the complexity of its business and the great number of devices manufactured by your company, aggregating many thousand separate items, every revision of values adds very heavily to the burdens of those in charge of the manufacturing department.

The arduous and admirable service rendered by the engineering and commercial departments cannot be too highly commended.

By order of the Board. C. A. Coffin, President.

#### FIRST VICE-PRESIDENT'S REPORT.

SCHENECTADY, N. Y., April 10, 1900. C. A. Coffin, Esq., President General Electric Company.

Sir: I submit herewith a brief report of the

operations of the sales department for the fiscal year ending January 31, 1900:

#### SALES.

It should be noted that the "profit on sales" is thus figured independently of various items on the profit and loss statement, the aggregate of which is a credit balance of \$1,673,270.02, making the total net profits \$5,479,130.20.

#### ORDERS RECEIVED.

The increase over last year in orders received is 51 per cent. The increase in each class is: 

Over 142,000 separate supply orders were received, of which only 623 were in excess of \$1,000, the average of all being \$59.00. Over 10,000,000 incandescent lamps were ordered during the year. There were 11,807 customers on our books at the close of the fiscal year.

About 87 per cent. of the year's orders were on our standard terms of payment-cash within sixty days.

#### Orders Received for the Past Five Years.

riscal	vear	ending	Jan.	31.	1896	\$13,235,016
••	• • •		**	""	1897	11,170,319
••	**	**	44	"	1898	14,382,342
		• •			1999	
**	**	**	••	"	1900	26,323,626

#### LOCAL OFFICE INVENTORIES.

Local office inventories have been increased \$180,031 during the year and are maintained in good saleable condition. The recent inventory shows:

ActiveObsolete	18.853	96.6 2.8 0.6	p <b>er</b>	cent.
	965H 054	100 5	OF (	ont

#### GENERAL REMARKS.

The past year shows a very large increase in volume of business over any previous year, due in part to much higher prices caused by the very considerable increase in cost of raw ma-The policy of consolidating small lighting and railway companies and substituting one large generating plant for two or more small ones has been continued and has caused a marked change in the character of electrical apparatus now being purchased. Large multiphase generators with alternating current distribution and rotary converter sub-stations are almost exclusively used in such consolidated stations when the transmission covers considerable distances.

The great increase in our orders (51 per cent.) has involved an increase of 141 per cent. in the expenses of the sales department, and has necessitated more and harder work on the part of all department and local office managers and sales agents. It would be difficult to find a more loyal, hard-working and faithful corps of employes than is to be found in this department, and I desire to express my great appreciation of the energy, zeal and loyalty shown by them during the past year.

Mr. S. Dana Greene, general sales manager and chairman of the local companies' committee, met with a tragic death at Schenectady in January last. His death is not only a serious loss to the company, but also a personal bereavement to all of his friends and associates in the company. Respectfully submitted,

EUGENE GRIFFIN, First Vice-President.

## THIRD VICE-PRESIDENT'S REPORT.

SCHENECTADY, N. Y., April 10,1900. C. A. Coffin, Esq., President General Electric Company.

SIR: I submit the following report on manu-

facturing and engineering for the fiscal year ending January 31, 1900:

#### MANUFACTURING.

The usual practice of billing the output of the works to the General Office at estimated factory cost has been continued. This cost includes all material and labor plus a percentage to cover all items of general manufacturing expense and engineering, and an ample allowance for depreciation. The percentages thus added to material and labor have been demonstrated by the annual inventory to be sufficient, as will be seen by reference to the financial statistics given in the report of the second vice-president.

The great increase in our orders has strained our factory facilities to the utmost, notwithstanding the liberal additions heretofore made to our machinery and buildings. We were fortunate in having completed and equipped, at the Schenectady Works, the large machine shop mentioned in my last report. This shop is now crowded with work.

There have been erected at the Schenectady Works during the past year a forge shop of 16,000 sq. ft. and a storage building of 12,000 sq. ft.

Additions aggregating about 55,000 sq. ft. have also been made to the drafting room, pattern shop, punch press shop and brass foundry, all substantial buildings of brick and iron construction.

The large iron foundry which was completed about a year ago has been found inadequate, and an extension of about 40,000 sq. ft. is now under way.

An extension to building No. 23, of about 40,000 sq. ft., has been started. This is needed to take care of the increased demand for switchboards, controllers, and similar apparatus.

At the Lynn Works we have completed a further extension to our steel foundry, of about 18,000 sq. ft. Also the new building for the manufacture of meters and instruments, mentioned in my last report, is now so crowded that a further increase of 7,000 sq. ft. has been found necessary and is now under way.

We have purchased 14 acres of land at the River Works, at Lynn, in order to give room for future extensions.

At the Harrison Works the large fire-proof building, mentioned in my last report, has been completed and is in full operation, and further extensions are under consideration in order to give the needed increase in our output.

The total area of the factory buildings aggregates approximately 2,000,000 sq. ft., which will be increased 100,000 sq. ft. when the buildings now under way are completed.

The number of employes in all the works is about 12,000.

We expended during the past year for new buildings, extensions and machinery equipment, a total of about \$900,000,exclusive of the expenditures for patterns, special tools, furniture, etc.

#### ENGINEERING.

The engineering work during the past year has been chiefly in the direction of improved efficiency and overload capacity, and in the design of larger sizes of apparatus of existing types.

A number of the great electric generators (5,000 hp.) for the new station of the Metropolitan Traction Company, of New York, have been in operation for several months and are regularly supplying current for the operation of electric street cars and for lighting in the city of New York. We are now manufacturing

eight machines of the same general character, which will be installed in the new station of the New York Gas, Electric Light, Heat & Power Company, of New York City, and used for the generation of current for lighting and power purposes, aside from electric street railways.

There has been a marked increase in the size of electric generators, of the direct current type, suitable for lighting and power for moderate distances.

Long distance transmission plants have increased in number and importance during the past year.

The revolving field type of alternating generator with stationary armature winding, permitting the direct generation of electricity at high potentials, a form exclusively introduced by us, has met with great success and is now generally employed to the exclusion of older and less perfect types. Our orders during the year for this type of generator alone amounted to over 200,000 horse-power.

We have sold during the year about 150,000 hp. of large transformers of the air blast type, a design introduced and supplied solely by us.

The United States Navy has generally adopted electricity in place of steam or hydraulic machinery for pumping, hoisting, ventilating, and operation of turrets, as well as for lighting and small power work.

There has been a continued increase in the number of electric motors used for driving machine tools in factories, and in such special applications as the operation of printing presses, ventilating, pumping, mining, cotton mill and paper mill machinery.

We have filled many important orders, covering all classes of our apparatus, for use in foreign countries.

There has been a marked increase in the demand for electrical apparatus of special design, which is more expensive than standard, takes longer to produce and diminishes the effective output of our works. To meet this demand we are systematically increasing our line of standard sizes, which can be produced of superior quality in shorter time and sold at a lower price.

There has been a continued improvement in the efficiency and quality of our numerous small articles of manufacture, such as are lamps, transformers, and particularly switchboards.

We have continued to protect our new and important engineering designs, as far as possible, by applications for letters patent.

The work of our factory managers and engineers is worthy of the highest commendation.

Respectfully submitted,

E. W. RICE, JR., Third Vice-President.

#### SECOND VICE-PRESIDENT'S REPORT.

SCHENECTADY, N. Y., April 10, 1900. C. A. Coffin, Esq., President, General Electric Company

Sin: The balance sheet and statement of profit and loss, herewith transmitted—with explanation of every item on the balance sheet—include the assets and liabilities and profit and loss accounts of the Edison General Electric, Edison Electric Light, and Thomson-Houston Electric Companies (which, for convenience of book-keeping, are consolidated with those of the General Electric Company) at January 31, 1900; and when "the company" is spoken of, all the above mentioned corporations are included.

#### ASSETS.

#### PATENTS, FRANCHISES AND GOOD-WILL.

Leaving all the patents. franchises, good-will, etc., of the company standing on the books at the date of the report, as per balance sheet, at \$2,000,000.00 FACTORY PLANTS.

This account represents the real estate (lands and buildings); machinery (steam plants, tools, appliances, etc.); patterns (including drawings, etc.); sundries (fittings and other small property accounts) of the manufacturing plants at Schenectady, N. Y., Lynn, Mass., and Harrison, N. J.

All are free from mortgage or other lien.

The lands of all three plants now amount to about 174 acres and the total factory floor space of all their buildings is approximately 2,000,000 square feet.

It is worthy of note that the entire book value (\$1,858,044.65) of all lands and buildings is less than one dollar per square foot of the total manufacturing floor space in those buildings.

The company's constantly growing business has necessitated continuous expenditures to increase its manufacturing capacity by acquiring more land, enlarging old and erecting new buildings and for general improvements and new machinery. The cost of these additions has been charged against the general earnings of the company, as have also all expenditures for the maintenance and repair of buildings and machinery, plus an allowance to provide for depreciation.

Harrison plant (lamp factory). 200,000.80

A summary of the changes in this account since the last annual report is as follows:

В	ook value Jan. 31, 1899.	additions	Written off at the end or the year.	Book value Jan. 31, 1900.
Real estate.				\$1 858 044 65
Machinery.	1,542,955 8	5 630,633.00	651,658.00	1,541,955 35
Patterns	1.0	0 161,157.42	161,157.42	1.00
Sundries*		0 198 310 86	128 310 86	1.00

Totals.....\$3,400,002.00 \$1,330,428.40 \$1,330,428.40 \$3,100,002.00

\*Include office furniture and fixtures of the factories, houses and trucks, shop fixtures, benches, steam fitting above ground for heating system, sprinkler system for fire protection, electric wiring of buildings, etc.

## REAL ESTATE.

#### (Other Than Factory Plants.)

This account represents the investment in the Edison Building. 44 Broad street, New York City; also a four story brick building covering five lots on the corner of Avenue B and 17th street, New York City; and sundry parcels of land in various piaces, mostly improved and rented, which have been acquired at various times, chiefly in payment of debts.

All are free from mortgages and will be sold when opportunities offer.

This account has decreased \$51,391.28 during the year, chiefly by selling real estate in Atlanta, Ga., and Rock Island, Ill.

#### STOCKS AND BONDS.

Pursuant to the established policy of selling securities, which there is no special reason for



holding permanently, various stocks and bonds have been sold for cash since the last annual report.

Their total par value was \$2,755,518 05.

They were sold for	\$2,678,409.03
They had been carried on the books at	1,839,551.30
Profit	\$838,857.78

The money realized from the above sale of assets was expended upon extensions to the factory plants, in purchasing \$400,000 of the company's own debentures and to protect and improve existing investments by acquiring (at a cost of \$1,274,428) miscellaneous stocks and bonds, of the aggregate par value of \$1,693,400.

In the book valuations of stocks and bonds remaining on hand since January 31, 1897, no material changes have been made since they were appraised three years ago. The book value of those not readily salable was then fixed, after careful examination of their worth at that time. Those having a market value are still carried under the price of then reported sales.

Those more recently acquired are carried at cost.

Schedules A and B annexed hereto contain lists of the most important of the company's holdings of stocks and bonds. Their total par value is \$11,466,309. They are carried at an aggregate book value of..........\$5,754,748.03

In addition, the company owns various other securities. As their present value is doubtful and their future value speculative, they are not set forth in the schedules. They are carried on the books as follows:

Stocks and bonds of local lighting and street railway companies wholly owned (par value \$151,500).....

Sundry holdings (par value \$418,-882).....

41,852.00

335,547.01

121.00

Miscellaneous securities of many underlying manufacturing, selling and patent owning corporations, and also of street railway and lighting companies, carried at one dollar for each lot, in all

Total book value of all stocks and bonds, as per balance

#### NOTES AND ACCOUNTS RECEIVABLE.

This accout represents the total debts now due the company.

They appear in the annexed balance sheet at and estimated realizable value—i.e., from their face, \$7,314,930.12 (which is less than the billed amount of goods shipped during the last ninety days of the year), has been deducted an allowance of \$337,119.82 for possible losses (see allowances for possible losses).

I believe this allowance to be a fair one and ample under existing general conditions of business in the country.

## Sales and Collections During the Year.

The net amount of sales billed to customers during the year exceeded twenty-two million dollars—those of the last three months aggregating nearly seven million five hundred thousand dollars.

Of some 11,800 regular customers on the accounts receivable ledgers, there were debit balances against 4,600 at the close of the fiscal year.

	Notes receivable.	Accounts receivable.	Total face values,
Total face value Jan. 31, 1899 Of which there have	\$1,493,630.99	\$4,313,330.76	\$5,809,961.75
been sett!ed during the past year		4,031,227.77	5,180,503.65
Leaving unmatured or unsettled originat- ing prior to the cur- rent year-51 note			
accounts and 34 open accounts	344,355.11	282,102.99	626,458.10
unsettled balances of the current year are	633,711.57	6,054,760.45	6,688,472.02
Total face value, Jan. 81, 1900	978,064.68	6,336,863.44	7,314,930.12
" Dollar	" Notes an	d Accounts.	

In addition to the above there are old notes and accounts receivable of one hundred and ninety-two debtors, aggregating \$1,272,665.95, which have been written off to profit and loss except the nominal book value of \$1 for each debtor. They stand on the books at a total of \$192 and are being liquidated gradually. The total amount realized from this class of notes and accounts by settlements made during the past year was \$7,457.46.

Allowances	for	Possible	Losses.

	Notes	Accounts.	
I	Receivable.	Receivable.	Total.
On debts existing at January 31, 1859, there was then allowed	\$298,150.00	<b>\$</b> 422,282.93	\$720,412.93
the current year, in effecting settlements	248,169.76	368,558.17	616,727.98
Balance of allowance still standing on the old debts	49,960.24	53,724.76 68,590.52	103,685.00 68,590.5 <b>2</b>
Total allowance on old debts	49,960.24	122,315.28	172,275.52
ances of the current	22,231.07	142,613.23	164,844.30
Total present allow- ance for possible losses Total face value	72,191,31 978,066,68	264,928.51 6,336,863.44	337,119.82 7,814,930.12
Add book value of			6,977,810.30
"dollar" notes and			192.00
Total book value as			

per balance sheet ..... \$905,875.37 \$6,071,934.93 \$6,978,002.90 In the settlements of old debts, on which

there were allowances for losses, as above shown, there were realized \$185,297.72 over last year's book valuations, less \$39,968.82 loss in settling some debts below their appraised value. Net gain above appraised value \$145,-328.90.

### WORK IN PROGRESS.

This account does not include outlays for anything in process of manufacture at the factories, but represents expenditures for labor, material, etc., at cost, on 560 incompleted installations of finished apparatus in progress at various places.......\$1,024,552.60

Less partial payments thereon, received under the terms of

the contracts as work progressed 150,424.24

Balance as per balance sheet... \$874,128.36

None of the estimated profit to be derived from these installations is included in the earnings of the year.

#### INVENTORIES.

These accounts represent actual inventories—counted and valued item by item—of raw materials and goods manufactured and in process of manufacture at the factories; of shipments in transit to storerooms of local offices; of manufactured goods in storerooms of local offices; of materials in local repair shops; and also of all goods on consignment.

Raw materials have been valued at the lowest price paid by the company during the last three months of the fiscal year. The market

price prevailing on January 31, 1900, was used where it was lower than the lowest price paid by the company during the said three months.

Active-selling finished and partly finished apparatus and supplies were valued at estimated factory cost; inactive or slow-selling apparatus and supplies at about 50 per cent. of estimated factory cost; and obsolete apparatus and supplies at scrap value.

#### Factories.

On the above basis, the inventories of the factories exceeded their book value. Following the practice of previous years, the whole of such excess has not been taken as a profit, but a portion has been retained as a reserve against possible increased cost of manufacturing, in case of further advance in prices of raw material.

The very large increase over last year's total factory inventories is due to accumulation of work—owing to the unfilled orders in process at January 31, 1900, being \$3,000,000 more than those at January 31, 1899, as well as to the increased value of the raw materials included in these inventories.

#### General and Local Offices.

During any fiscal year, goods are taken in and out of local office inventories at the estimated factory cost then prevailing. Consequently, at the close of that fiscal year, there must always be considerable change in book values of finished apparatus and supplies carried over—to adjust their inventory prices to latest estimated factory costs and to provide for losses due to returned articles, cost of repairs, breakages, boxing, reclassifying and writing down the book value of goods no longer quick-selling, etc, etc.

Owing to present increased estimated factory cost, the inventories of apparatus and supplies in all local offices showed an increase over book value of \$33,286.04 which amount has not been treated as a profit, but is held as a reserve.

#### Office Furniture and Fixtures.

The total inventoried value of all office furniture and fixtures, machinery, tools, instruments, etc., in the general and local offices, and in local repair shops was \$78,921.99. All these items have been reduced to a total book value of one dollar, and the difference charged to this year's profit and loss.

#### Consignments.

Finished apparatus for novel uses has been delivered to various concerns subject to purchase if its operation is successful. The greater part of consignment account represents such contingent sales, and the remainder represents apparatus on exhibition or loaned to regular customers for temporary use by them.

#### LIABILITIES.

The company has no note payable, nor is there under discount any paper bearing the company's endorsement or guaranty.

It has not borrowed any money, nor has the company's credit been used during the year either by issuing notes, endorsing customers' paper for discount or lending its name in any way; but by adhering to its established policy of maintaining sales on a basis of cash or short credit to desirable customers, all purchases have been paid for in cash.

#### DEBENTURES.

During the year the company has purchased



and canceled \$400,000 of its own 5 per cent gold coupon debentures, due June 1, 1922, at an. average cost of 117.68 per cent.

#### ACCOUNTS PAYABLE.

This account includes all unpaid audited indebtedness

At the close of business on January 31, 1900, the unpaid vouchers on hand-none of which was then due under the terms of purchaseamounted to ..... \$317,020.03

Between January 31 and February 26, 1900, the date of closing the general books, additional liabilities belonging to the past year

were audited, amounting to ..... 686,344,02

Total as per balance sheet....\$1,003,364.05 The amount of unpaid vouchers carried over in this way monthly-by keeping the books, other than the cash book, open a sufficient time to include each month's obligations in that particular month-has averaged during the year about \$860,000.

#### ACCRUED INTEREST ON DEBENTURES.

This account, as its name implies, is the full amount of 5 per cent, interest accrued to January 31, 1900, on the company's \$5,300,000 outstanding debentures.

#### UNCLAIMED DIVIDENDS.

This account represents the full amount unpaid on all dividends declared and payable to January 31, 1900, inclusive—the addresses of a few stockholders being unknown.

Respectfully submitted,

J. P. ORD. Second Vice-President

## (Schedule A.)

STOCKS.	
CORPORATE NAME.	AR VALUE.
Australian Gen. Kiec. Co., Schenectady, N. Y Augusta, Ga., Railway & Electric Co Boston & Revere Elec. St. Ry. Co., Boston	\$50,000
Augusta, Ga., Railway & Electric Co	160,000
Boston & Revere Elec. St. Ry. Co., Boston	11,900
Buffalo, N. Y., General Electric Co Binghamton, N. Y., General Electric Co	181,500 6,300
British TH. Co., Ltd., London, Eng	<b>68</b> ,350
Cie d'Alectricite TH. de la Mediterrance, Paris	180,000
Compagnie Francaise, etc., TH., Paris	50,000
Compagnie Francaise, etc., TH., Paris Chattanooga, Tenn., Light & Power Co	135,000
Cincinnati, O., Edison Electric Co	<b>26</b> 6,63 <b>3</b>
Citizens' Gen. El. Co., pref., Louisville, Ky	67,900
com,	267,300
Consolidated El. Lt. Co., Birmingham, Ala	237,000
Oleveland, O., Elec. Ill. Co., com Ohicago, 1ll., Edison Co	187,000
Columbus O. Edison Light Co. pref	190,300 20,100
Columbus, O., Edison Light Co., pref	3,20
Des Moines, Is., Edison Light Co	438,680
Edison Ill. Co., Detroit, Mich	6,000
" Electric Light & Power Co., Erie, Pa.	14,400
"Light Co. of Grand Rapids, Mich	24,000
Edison Electric Co., pref., New Orleans, La	1,828,200
" " com., "	1,490,000
Eligin City, Carpentersville & Aurora RR.Co Elisworth, Me. Water Co	25,000
First Cincinnati, O., Edison Elec. Ill. Co	32,300 8,700
Fall River Mass Electric Light Co.	9,000
Fall River, Mass., Electric Light Co Fort Wayne, Ind., E estric Works	500,000
Home Riectric Co. Dubuque Is	49,100
Kingston, N. Y., Electric Co	43,650
Kansas City, Mo., Sub. Belt Line RR. Co	4,100
Kaneas City, Pitts. & Gulf RR. Co Laramie, Wy., E. G. L. & F. Co	1,750
Laramie, Wy., E. G. L. & F. Co	16,500
Marshfield Electric & Gas Co , Portland. Ore	10 500
Missouri Edison Flac Co. St. Louis, Mo.	<b>5</b> 0,000 <b>2</b> 0,000
Mexican Gen. Elec. Co., Schenectady, N. Y Missouri Edison Elec Co., St. Louis, Mo Northern Ry. & Imp. Co., N. Whatcom, Wash.	58,100
Otis Elevator Co., Yonkers, N. Y., pref	60.000
People's El. Lt. & Pr. Co , Oswego, N. Y	101,000
Northern Ky. & Imb. Co., N. Whatcom, Wash. Otis Elevator Co., Yonkers, N. Y., pref. People's El. Lt. & Pr. Co., Oswego, N. Y. Portland, Ore., General Electric Co., com Rutland, Vt., City Electric Co Raleigh, N. O., Electric Co Seattle, Wash., Electric Co., pref. Schenecady, N. Y., Realty Oc Seneca Edison Co., Seneca Falls, N. Y Schenectady, N. Y., Rallway Oc South African Gen. El. Co., Schenectady, N. Y.	627 800
Rutland, Vt., City Electric Co	38,500
Raleigh, N. C., Electric Co	9,000
Beattle, Wash., Electric Co., pref	42,000
Scheneciady, N. 1., Essity Ur	100 000
Schenestedy N V Pailway Co	87,800 199,900
South African Gen. El. Co., Schenectady, N. Y.	50,000
South American Gev. El. Sup. Co. Schene ctady.	12,500
Union Elec. Co., Seattle, Wash	50.000
Union Elec. Co., Seattle, Wash Union Elektricitats Gesellschaft, Berlin, Ger	23,800
United Elec. Securities Co., com., Boston	500,000
Utica, N. Y., Belt Line Street Ry. Co., pref	<b>50</b> ,000
Total	\$8,574,163
Total book value	
Average per cent. of book value of above na	
to par 42.86.	
Note.—The corresponding per cent. of stocks annual report was 43.05.	in the last
(Schedule B.)	

BONDS. 

Amount carried forward.....

Amount brought forward	\$82,000
Ashland, Wis., Light, Power & St. Ry. Co	110,000
Butte, Mont., Gen. Electric Co	14 000
Butte, Mont., Gen. Electric Co	7 000
Brush Electric Co., Cleveland, O	166,000
Columbus, Ga., RR. Co	43,000
Chattanooga, Tenn., Light & Power Co	20 000
Charleston, S. C., Corsd. Ry., Gas & Elec Co	70,000
Citizena El.Lt. & P. Co.rec'is c'ifs, Hounton, lex	46.00)
Decatur, Ala., Light, P. wer & Fuel Co	15,000
Dedham, Mass., Electric Co	20 000
Edison Electric Co., New Orleans, La	300,000
Edison Electric Co., Los Angeles, Cal	86,000
Fort Wayne, Ind , Water Power Co	19.000
Gallitzen, ra., Electric Light Co	7,000
Geneva, N.Y, Pr. & Lt. Co	49,000
Jackson, Mich., Light & Power Co	32,000
Kansas City, Pitts. & Gulf R. Co Kansas City, Mo.	3.000
Little Rock, Ark., Edison Elec. Lt. & Pr. Co	13,000
Little Rock, Ark., Trac. & El. Co.(2d mortg)	77,000
Lamer, Mo , Water & Electric Light o	5 000
Mahoning Valley RR. Co., Youngstown, O	149,000
Madison, Wis., Elec. Railway Co	22,000
Mentana Power Transmission Co., Butte, Mont.	80,000
New Orleans, La. & W. RR Co., rec'rs ctf4	18,181
Northern Ry. & Imp. Co, New Whatcom, Wash.	45 000
	25 000
Naps, Cal., Gas & Electric Co	10,000
Oshkosh, Wis., Electric Light & Power Co	5,650
Phoenix, N. Y., Electric Light Co	3,000
	147,715
Public Works Co., Bangor, Me People's Elec. Lt. & Pr. Co., Oswego, N. Y	90,000
	2,100
Peninsula Lighting Co., Redwood City, Cal	6,000
Raleigh, N. C., Clectric Co	
Rutland City, Vt., Electric Co	28,000 257,000
Pacramento, Cal., Electric, Gas & Ry. Co	
Seattle, Wash., Electric Co	140 000
Schenectady Railway Co., Schenectady, N Y,	230,000
Seneca Edwon Co., Seneca Falls., N.Y	80,000
Twin City Gen. Elec. Co., Ironwood, Mich	15 COO
Tacoma, Wash., Railway & Power Co	441,000
United Gas & Electric Co, Dover, N. H	20 000
Utica, N. V., Belt Line St. RR Co	5,000
Winona, Minn., Ry. & Lt. Co	36,000
Water, Light & Power Co., St Cloud, Minn	2 500
Total	\$2 802 146

NOTE —The corresponding per cent. of bonds in the last annual report was 64 77.

books and accounts of the General Electric Company, the Edison General Electric Company, the Edison Electric Light Company, and the Thomson-Houston Electric Company, for the year ending January 31, 1900, and hereby certify that the consolidated income accounts published in the foregoing annual report of the General Electric Company, as of January 31, 1900, correctly state the results of the business for the period, and that the balance carried down in profit and loss account includes the closing of all income and expense accounts: also accrued interest on debentures and all accrued dividends on preferred stock and all dividends on common stock to January 31, 1900.

We further certify that the consolidated condensed balance sheet, published herewith, correctly states the assets and liabilities of the company at January 31, 1900, as shown by the books.

In the course of this examination we audited the pay rolls, checked all vouchers for disbursements, and found that such disbursements were correctly carried into the general books of account: also traced the sales from the shipping department through the sales journals into the general ledger.

We verified the cash balances by comparison with pass books or statements of the various banks of deposit and by actual count of cash in the treasurer's office. The only cash items not

### Consolidated Balance Sheet of January 31, 1900.

ASSETS.	LIABILITIES.					
Patents, franchises and good will       \$2,000,000 00         Factory plants       8,400,002.00         Real estate (other than factory plants)       553,643.44         Stocks and bonds       6,132,268.04         Cash       \$1,537,071.86	Capital stock:  7 % cumulative preferred \$2,551,200,00  Common					
Notes and accounts receivable \$6,978,002.30  Work in progress	Accounts payable					
Inventories: Factories\$7,264,666.01 Genr'l and local offices 787,580.28 Consignments	Profit and Loss					
	\$29,532 697.0					

Sales	Consolidated Profit and Loss	Account of January 31, 1900.	
Sales	EXPENSES.	EARNINGS.	
ances for losses	General expenses, taxes, depre-	Balance Jan. 31, 1899 (aurplus)	\$156,570.99
Dividends paid:   Dividends and interest received	ances for losses		
On preferred stock—7 % for the year	Interest on debentures* 281,666.67		
Jan. 15, 1900	On preferred stock—7 % for the year	on stocks and bonds owned \$309,425	
tures purchased and canceled 70,710.88	Jan. 15, 1900 822,420.00	I TOTA OIL SELEN OF STOCKS BILL D. CE	7.78
Balance January 31, 190J (surplus)		tures purchased and canceled 70,710	
			768,146.9 \$24,562,688.6

Oa \$5,700,000 for ten months and oa \$5,300,000 for two months

#### REPORT OF THE ACCOUNTANTS.

NEW YORK, April 16, 1900.

To the Board of Directors of the General Electric Company.

We have made a critical examination of the

verified were the various small balances carried in the distant branch offices.

We verified the amounts of stocks, bonds and bills receivable owned by the company, either by actual count of the securities in the



office of the treasurer or by receipts and certificates of the trust companies and other custodians of the same.

We examined, item by item, into the book values of the stocks and bonds owned, and we are satisfied that in the aggregate the actual value of the securities is fully equal to the amount at which they are carried on the books.

The large profits realized on the securities sold during each one of the past several years demonstrates that they were carried at a conservative valuation. All of the stocks and bonds owned by the company, exclusive of those carried at one dollar for each lot, were inventoried at the end of the last two fiscal years as follows:

 January 31, 1899.

 Stocks at....
 42,95%
 44.53%

 Bonds at....
 63.79%
 70.45%

We observed the methods employed by those familiar with the circumstances to determine the estimated amount charged off as a reserve against bad debts and other possible losses on notes and accounts receivable, and are satisfied that such estimates were carefully and fairly made. These methods are fully justified by the outcome of the estimates of previous years made on the same basis, the result being a profit over the reservation on the notes and accounts collected. The collections are closely made and the results show the credits are well supervised.

The technical nature of the business of the company, and the wide range, number and variety of the articles manufactured, render it impracticable for any persons not mechanically expert in the various lines and familiar with the goods, to correctly identify and inventory them; therefore, the inventories at January 31, 1900, were necessarily taken and priced by the company's own experts. We, however, noted the manner in which the inventories were compiled, item by item, and verified the computations. Our knowledge of the instructions given and the methods and precautions followed to insure correctness leads us to believe that said inventories were carefully and conservatively taken and that the total value of the goods is not overstated in the amount carried over in the balance sheet.

We have not attempted to appraise the manufacturing plants, but in our opinion, which is based upon our observation of the methods of treating improvements to the plants and the amounts charged off for depreciation, the policy of the management regarding charges to plant is unusually conservative and commendable.

As to the value of the patents and franchises we do not feel competent to express an opinion. The patents, franchise and good will account, now reduced to \$2,000,000, contains all items properly chargeable thereto.

We observed the instructions given and the precautions taken to enter all accounts payable on the books at the time of closing and are satisfied that all known existing current liabilities of the company are included in the balance sheet.

The policy of the company as reflected in its accounts is to charge off all ascertained shrinkages or losses immediately, and at the end of each year to make liberal allowance for possible losses; but no profits are written until sales are made.

We have read the report of the second vicepresident and find that it correctly explains each item of the balance sheet and sets forth in exact terms the general accounting methods of the company.

PATTERSON, CORWIN & PATTERSON, Certified Public Accountants.

#### THE GIME SPEED REGULATOR.

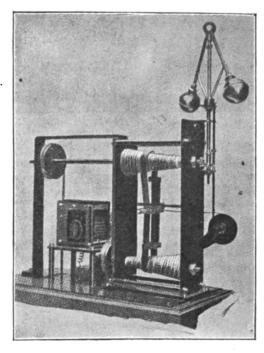
Translated for Electricity from "La Vie Scientifique,"

Among the thousand and one problems which engineers have attempted to solve, there is little doubt that the most important is a speed regulator combination that is capable of meeting all industrial requirements.

It is easy to understand that the question is truly of considerable importance.

When the motive power of a factory is furnished by a steam engine, naturally the engine selected is of sufficient power to meet all the requirements of running all the machinery or apparatus simultaneously, but in common practice it is seldom that the same power is constantly required, for at any time in a work shop some machines may be stopped and again started with the inevitable result that the consumption of energy by the machine tools furnished in quantity by the main power generator, varies incessantly, giving a general tendency toward an acceleration of speed or the opposite in variable proportions, according to the increase or decrease of work.

In all industrial operations the same difficulty is experienced, so much so that for a

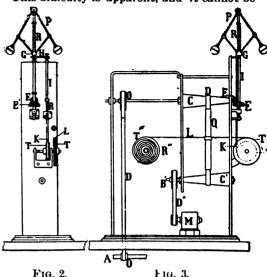


THE GIME SPEED REGULATOR.

long time special adaptations have been made to remedy the defect, such for example as the use of revolving weights of considerable dimensions, as exemplified in the Watt ball governor, commonly employed to open or close a steam supply valve, according to the decrease or increase of engine speed.

However simple and efficacious these regulator systems may be in themselves they are not suitable to all conditions. Sufficient in results to compensate for most of the extreme variations encountered in factories, they are not pliable and delicate enough to take care of the smaller and minimum speed regulations, or if in every day factory practice we are satisfied with a coarse regulation, there are other conditions where much more perfect speed regulation is essential. This is the case among others at least of electric dynamo installation on trains, where electric illumination is used for lighting cars, for here in fact we find present two conflicting conditions, where the proper burning of the lamps demand a constant and regular current, and where the generating dynamos are dependent on the speed of the train which supplies power, and which is constantly varying with the speed of the locomotive.

This difficulty is apparent, and it cannot be



remedied except with a speed regulator suitably constructed. This was so well known that in the trials recently made between Paris and Vintimille, under the auspices of the Paris-Lyons-Mediterranean Railroad Company, to eliminate the fatal variations of the electric lights due to change of speed, means were suggested to prevent a rise of over 25 amperes, which is obtained when the train attains a speed of 30 miles.

The system of regulation employed, although very good, was not sufficiently serviceable to meet all requirements. There was lacking an apparatus to insure perfect operation of the lamps, not only when the train was under full headway, but also when the speed was increased or diminished, and even when at a full stop.

As complicated as this problem appears, it has been solved by a speed regulator of novel construction invented by the able electrician, M. Gimé, who has also devised an ingenious means of assuring the automatic closing of car doors when a train is in motion.

The regulator is very simple in construction, and essentially consists of a varying element, interposed between the prime mover and the machine to be controlled, and of a Watt ball governor acting on a power transmitter, through an intermediate mechanical arrangement in such a manner as to diminish the speed when the driving axle speed increases, and vice versa,

The mechanism consists of two differential cone pulleys, C' and C, connected by a belt D. A ball governor P furnished with an opposing spring R, connected to the shaft B. The latter receives its motion from the pulley O, which is connected to the main shaft A, by means of the belt D', passing around pulley O. A cone gear E engages a smaller gear E', attached to the shaft of the ball governor P, Fig. 3.

The speed regulation is accomplished as follows: The shaft B' of cone pulley C' transmits motion directly to the generator, by means of the belt D"

The collar G of the governor, is furnished with an arm H, carrying a vertical rod I, which terminates in a flexible band K, which winds around a drum T. A spring R' presses against the rod I, to maintain the tension of the band K, on the drum T, which is connected to a second drum T', by a flexible band L. T' is



attached to the same shaft as the drum T, and on the other side is attached a small pulley T", acted on by a spring R". Finally on the flexible band L is attached a belt shifter Q, surrounding the belt D, Figs. 2 and 3.

We see from the above construction, that when the motive power quickens its speed above the normal the governor balls P rotate more rapidly and lift the collar G, and consequently the rod I upward, and the band L moves from the left to the right, carrying the belt shifter Q with it, and consequently the belt D.

It follows from the construction of the two differential pulleys C and C', that this displacement results in a diminution of speed, and that it becomes possible to maintain a constant speed for pulley C', and consequently for the driven mechanism.

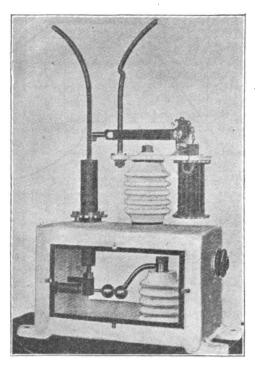
The opposite occurs when the motive power decreases its speed. In this case the governor balls fall, and assisted by the spring connected to the barrel R", the belt shifter Q is displaced from the right to the left, which results in an increase of speed for the receiving machine.

A more happy combination for the purpose could not be secured than that realized by M. Gimé in this regulator, and with little doubt it will rapidly receive the attention of specialists through the better results secured, and especially in its applications to electrical installations and to automobiles where it should prove profitable.

#### A HIGH-VOLTAGE SAFETY DEVICE.\*

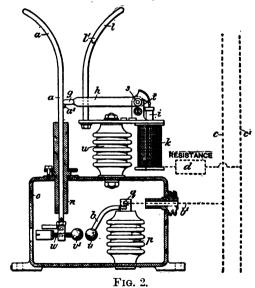
The protection of electrical circuits from abnormally high voltage, arising from accidental or other causes, probably had its earliest illustration in the lightning guard, the necessity for which arose when aerial wires were first used in connection with telegraphy. Since the introduction of the telephone, the electric light, and circuits for the transmission of power and for electric traction, similar protecting devices for guarding against the effects of lightning have from time to time been rendered necessary where aerial wires have been used. But where the circuits carry a large amount of power, the ordinary spark-gap apparatus is insufficient to guard the circuit from breakdown, for the flash across the gap breaks a path for the electrical power of the circuit, and a continuous flash across the gap takes place, the line being very speedily broken down from this cause. In order to obviate this, various devices have been introduced, such as sparkgaps between two metallic horns so constructed that the convection currents caused by the spark raise the spark upwards to a point where the gap is so wide that the voltage is no longer able to maintain the spark. This form of selfextinguishing lightning protector has been extensively used on electric power circuits with aerial lines. The abolition of aerial conductors on systems of electric supply mains in this country has not, however, removed from these mains the dangers which arise from excessive high voltage momentarily occurring. It is true that lightning does not affect these mains, but an equivalent effect is produced by the inductance and capacity of the cables and the apparatus connected to them whenever any portion of the circuit is connected or removed from the rest of the circuit. Thus, for example, in a system of high-voltage alternate-current distribution mains the connection or removal of a section of the circuit at the switchboard is liable to cause momentarily as much as a 50 per cent. or even greater rise in the pressure on the mains. The danger of even a temporary rise of this magnitude is considerable, owing to the liability of breaking down of transformers and other plant placed across the mains.

The problem of providing a reliable and



 $Fig. \ 1.$  The "Partridge" High-Voltage Safety Device.

quick-acting device to guard against this evil has occupied for some time the attention of Mr. G. W. Partridge, chief engineer to the London Electric Supply Corporation, with the result that a very ingenious and perfect form of apparatus has been evolved by him. The final form of this instrument is shown in Fig. 1. Its action is best explained by reference to Fig. 2, which gives a diagram of the internal



connections of the instrument and shows its connections to the cables. In this figure c is the inner and  $c^1$  the outer conductor of a concentric cable to be protected. Connection is made from the inner conductor c through a gland in the box to an insulated knob, v, which makes, with the knob  $v^1$ , an adjustable spark gap. The path of the spark after leaping the gap is from  $v^1$  to a, one of a pair of metallic

horns, the width between which increases with increasing height. The other horn is shown at 1. The gap between these two horns is normally short-circuited by a metallic lever. A. which is pivoted at s, the other arm of the lever carrying an iron core, i, which is suspended at the mouth of a solenoid, k. The circuit of the spark is therefore first across the gap, then by the horn a and along the lever h, whence it passes through the coils of the solenoid k and finally through a resistance, d, to the outer onductor  $c^1$ . It will thus be seen that the passage of any considerable discharge across the gap will energize the solenoid and attract the iron core, thus lifting the tip g of the lever until this strikes the outer horn lat the point  $l^1$ . The torrent or flash which will be produced between the horn a and the tip g will at this point,  $l^1$ , be transferred to the two horns at a point where the gap is sufficiently wide to allow the convection currents to lift the flash bodily upwards until it is extinguished by the widening between the upper part of the horns. In operation this piece of apparatus is remarkably prompt. We saw portions of the circuit rapidly connected and disconnected from the mains; and whenever the pressure rose more than 25 per cent. above the 10,000 volts normal pressure the apparatus promptly set itself in action, and in a small fraction of a second the earth discharge was effectively extinguished. It might be mentioned that the percentage rise above the normal pressure required to put the apparatus in action is adjustable, the spark-gap between the knobs v and v1 being adjusted by means of a set screw. It is further to be noticed that in this form of apparatus the whole of the exposed parts are normally dead, being connected to the outer concentric cable; all the live parts are contained within the box and also being carefully insulated.

#### A Vacuum Electroscope

It is a matter of considerable interest, from a theoretical point of view, to ascertain the nature of electrostatic actions in an absolute vacuum. With the improved apparatus now available, a much more perfect vacuum can be produced than was the case some years ago. Pflaum\* has constructed an electroscope in which the leaves were of aluminum foil and were enclosed in a pear-shaped glass bulb exhausted to a very high vacuum. The vacuum was by no means perfect, but was sufficiently good to show that a vacuum is probably a perfect insulator, and all electrostatic effects take place, though in an intensified degree. Two platinum wires were fused into the lower part of the bulb, between the ends of which was a spark gap of 0.4 mm. When a discharge was sent between these two wires from a 40 mm. induction coil, the leaves of the electroscope were violently affected.

If an electrified body is brought near the knob of the electroscope, the leaves diverge as in the ordinary electroscope, but when the body is removed the leaves come together, and then permanently diverge. The final effect is considered to be due to negative electricity discharged from the leaves on to the inner wall from the tube. If electric oscillations are produced in the neighborhood of the electroscope the leaves are thrown into violent vibration. If the oscillations are produced by the induction coil or Tesla coil the vibrations gradually pass into a permanent divergence. In the first case the permanent charge is of

<sup>\*&</sup>quot;Ann. der Physik," etc., page 290, 1900.



<sup>\*</sup>From the "Electrician," London

the same sign as the first discharge of the coil; in the second case, the sign of the charge is negative when the Tesla coil is near the electroscope, and positive when the coil is distant.—The "Engineers and Iron Trades Advertiser," Glasgow.

#### THE PARIS EXPOSITION.

(Special Correspondence of ELECTRICITY.)

#### The Palace of Electricity.

During the inauguration period, and before going into a detailed study of the many applications of electricity contained in the electrical department, it is better to devote the first article to a description of the magnificent palace which M. Henard, the prominent architect, has lately completed, to contain the powerful machinery, together with the numerous appliances sent by the electrical trade from all parts of the world, mentioned in an itemized list in one of our last reports.

The Palace of Electricity has lately undergone many changes, and is not yet completely finished and properly fitted. It occupies, with its annexes, the whole area of the Champ de Mars, its dimensions being 420 meters long by 80 meters wide. This immense structure towers above all the neighboring buildings, and a majestic entrance to it is found in the adjoining Chateau d'Eau. The Palace of Electricity is wholly constructed of iron and glass. The length of the facade is 158 meters, and becomes practically a continuation of the Water Castle. The vestibule of the first floor forms an artistic entrance from the Champ de Mars. It is gained by wide approaches and two flights of steps, which gives the ground floor the appearance, on entering, of being located below the surface.

An immense exhibition room of hexagonal form is on the first floor. It is designed to contain the wonders in electrical appliances and to exhibit marvelous lighting effects. This may be aptly termed the Electrical Hall of Honor. Two galleries extend the whole length of the hall.

The engine and boiler buildings are located to the right and to the left, as annexes to the Palace. They are actually the central stations, which furnish the energy for illuminating purposes, for all power requirements and for running the elevators. From these stations cables carry the electric current to the Trocadero, to the Quais, and to the banks of the River Seine, to the Champs Elysées, and to the Esplanade des Invalides.

The boiler grounds are sheltered under a steel shed, 28 by 105 meters. Each yard covers an area of 3,276 square meters. The dimensions of these two machinery halls are 50 by 117 meters.

The front of the Palace is constructed of embossed and open zinc work, composed of 9 spans covered with glass and transparent china in variegated colors. The roof line is surmounted by an open structure, which gives a daylight effect of fine lace work. It is brilliantly illuminated at night. The whole forms a magic decoration and a true apotheosis of electric lighting. The roof is shaped as an immense arc, composed of smaller arcs, which join one another and which are supported by pillars on each side, gradually diminishing upwards in The central span extends towards diameter. the Banquet Hall, and is surmounted by a border bearing the figures "1900." Above it is found a statue representing the genius of electricity. This statue stands upright on a chariot pulled by a dragon, while a Pegasus holds an electrode in each hand; at night a spark one inch long plays between these two electrodes, and an immense star with effulgent rays shines behind the statue.

The great arcade of the Chateau d'Eau forms an opening to a vast hemispherical slope, 25 by 11 meters. The basins are fed from a continuous waterfall, arranged in terraces, which give an increased luminous effect at night, This water spectacle requires 1,200 liters per second. It is fed by a water-raising power plant constructed on the banks of the River Seine. An immense cornice, bearing the coat of arms of the French Republic, forms a center-piece for the vault of the great arcade, which is joined by a double open-work decoration to the two rotundas crowning the back of the pillars at the entrance which admits to the vestibule of the Chateau d'Eau, and which serves at the same time as an entrance to the Palace of Electricity. At the opposite corners of the side passages there are areades symmetrical to those in the center. These passageways form angles of 45 degrees with the main entrance, the arcades terminating at the front in two cupolas, which form the vestibules of the palaces of Mechanical and Chemical Industries.

In another article I shall speak of the appliances, the elevated railroads, elevators and the moving sidewalk, which have been in operation since the opening.

## Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended April 28:

Antwerp, 28 cases, \$2,406; Argentine Republic, 72 cases, \$8,046; Barcelona, 21 cases, \$1,399; Berlin, 55 cases, \$1,120; Brazil, 2 cases, \$175; Bristol, 7 cases, \$400; British Guiana, 1 case, \$55; British Possessions in Africa, 134 cases, \$20,244; Canada, 2 cases, \$110; Central America, 38 cases, \$391; Cuba, 11 cases, \$94; Ecuador, 206 cases, \$1,953; Genoa, 33 cases, \$10,-341; Hamburg, 52 cases, \$3,094; Havre, 25 cases, \$5,485; Kieff, 1 case, \$60; London, 427 cases, \$51,-497; Manchester, 6 cases, \$450; Marseilles, 30 cases, \$300; Mexico, 86 cases, \$3,502; Peru, 28 cases, \$3,328; Porto Rico, 4 cases \$54; Southampton, 96 cases, \$1,329; Stockholm, 2 cases, \$15; St. Petersburg, 9 cases, \$519: U. S. Colombia, 10 cases, \$383.

### Automobile Stations on the Jersey Coast.

The New Jersey Electric Vehicle Transportation Company has arranged to install automobile stations during the coming season at the following points on the Jersey coast: Seabright, West End (Long Branch), Allenhurst, Spring Lake and Atlantic City. At each of these stations Columbia vehicles, both electric and gasoline, of various designs will be for sale, and a specialty will be made of charging and caring for Columbia automobiles owned by private parties. The location of the various stations insures proper accommodations for vehicles and offers a large field for driving. Park wagonettes and omnibuses will be available for special service and for parties wishing to make trips through the surrounding country. The New York Electric Vehicle Transportation Company has opened a salesroom at 541 Fifth avenue, New York City, where all types of Columbia automobiles are exhibited, and

where information regarding prices, etc., can be obtained.

#### National Electric Light Association Convention.

Unusual interest is being manifested by central station managers throughout the country in the meeting of the National Electric Light Association Convention to be held at Chicago May 22, 23, 24. The indications are that there will be a very large attendance of electric lighting men. The programme has been made up from suggestions from central station managers as to their needs, and a glance will show that the themes treated are in the hands of men who thoroughly understand their subjects. Among the papers to be read are the following:

"Uniform Accounting," Lieut, James Blake Cahoon, Syracuse, N. Y.

"Equitable, Uniform, and Competitive Rates," Henry L. Doherty, St. Paul, Minn.

"Central Station Economies," W. L. Abbott, Chicago, Ill.

"Series Inclosed Alternating Arc Lamps," William Lispenard Robb, Hartford, Conn.

Other papers and topics of equal interest will be announced later. The committee reports are also of much value, and promise to be very complete.

## The Philadelphia Meeting of the American Institute of Electrical Engineers.

The 17th General Meeting of the A. I. E. E. will begin on May 16, at 2 P. M., at the Drexel Institute, 32d and Chesnut streets, Philadelphia, and will be continued by morning sessions on the 17th and 18th. Papers will be presented by A. D. Adams, Capt. John Millis, Prof. R. B. Owens, Fitzhugh Townsend, Capt. G. O. Squier and Dr. A. C. Crehore, Carl Hering and Prof. W. H. Freedman. The Philadelphia Local Committee, C. A. Bragg, chairman, has in contemplation, among other events, the following social functions: Afternoon sail down the Delaware, and shad dinner for ladies. Gentlemen's smoker. Visit to Cramp's ship-yard and shad dinner at Washington Park, Gloucester. Ladies' Automobile trip, including visit to Girard College. Evening theater party. Organ recital, Drexel Institute.

#### PERSONAL MENTION.

Mr. Thomas P. Amoss, vice-president and general manager of the Automobile Company in Baltimore, Md., was instrumental in forming the Autocarrette Company at Washington, D. C. Mr. Amoss is now arranging to organize a similar company in New York State, and build for its use five of the same style of vehicles.

Mr. W. Kesley Schoepf, formerly general manager and engineer of the Baltimore Security and Trading Company, has gone to Pittsburg, Pa., to accept the position of general manager of the Consolidated Traction Company of that city, and will hold the same position in the Union Traction Company, which combines the street railways of Pittsburg into one system.

Mr. Clark L. Ingham, of Buffalo, N. Y., general man ager of the Niagara Falls Gas & Electric Light Company, has succeeded Louis A Boore as superintendent of the company's plant at Niagara Falls.

Mr. H. J. Wilson Humbird, has been elected a director in the Cumberland (Md.) Electric Railway Company, to fill the vacancy caused by the resignation of ex-Governor Lloyd Lowndes.

Mr. Herschel A. Benedict, of Albany, N. Y., who for several years has been the electrical engineer of the Hudson Street Railway, has been appointed chief engineer of the United Traction Company.

Mr. Edwin Holmes, president of the Holmes Electric Protective Company of this city, celebrated his 80th birthday on April 25. He received the congratulations of numerous friends and a large number of employes of the company, many of whom have been with him from twenty-five to thirty five years.



#### INCORPORATIONS.

The City Lighting Company, Peru, Ind.—to furnish electric light and power. Capital stock, \$25,000. Incorporators: S. V. Parrott, H. C. Ulen and A. G. Parrott, all of Peru.

The B. B. Electric Company, New York City. Capital stock, \$30,000. Directors: J. T. Beswick and David Beswick, Brooklyn; E. Nicholson, New, York City.

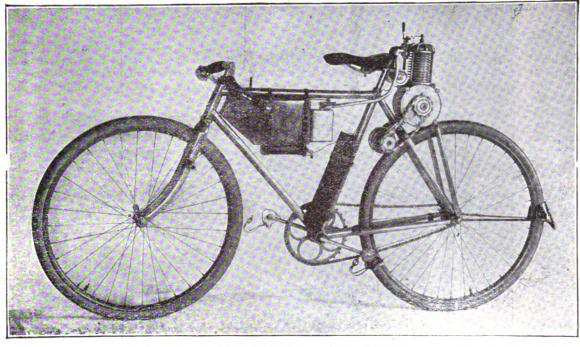
The Port Washington Electric Light, Heat & Power Company, Port Washington, N. Y. Capital stock, \$7,500. Di

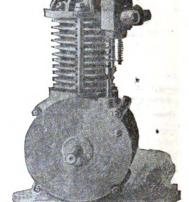
#### COMMERCIAL PARAGRAPHS.

#### NEW STYLE OF AUTOMOBILES.

Automobiles are now within reach of the ordinary business man and the middle classes. Up to three months ago the prices for automobiles ranged from \$1,000 to \$5,000 each, but lately the price has been reduced to \$750 and upwards. A new company has been formed bearing the name of the Crescent Automobile Manufacturing Company, and organized under the laws of Delaware with a capital stock of \$500,000,

have tried and failed, and that is to overcome the inertia without jar to the occupant. The motor is first started by a small wheel situated on the right of the operator, and in about one minute full 4 hp. is obtained; then the transmission gear is applied and the start is made at the rate of one-half mile per hour, the occupant being hardly aware of the carriage having started, and the operator can then run his vehicle to any desired speed. The motor mounted on the bicycle shown is claimed to have run over 3,200 miles without repair and is today in as good condition as when first built. The company's small motor is especially adapted for bicycles of any make or





P-T CRESCENT 1 HP. MOTOR, \$75.

## CRESCENT MOTOR BICYCLE.

rectors: Charles F. Lewis, L. B. Smull, J. O'Brien, John J. McDermott and John H. Burtis, all of Port Washington.

The Keystone Electric Company, Philadelphia, Pa,—to engage in manufacturing, engineering and construction work. Capital stock, \$200,000.

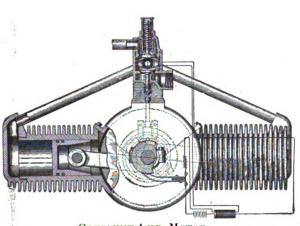
The Urbana Merchandise Electric Railway Company, Urbana, O.—to own and operate a railway. Capital stock, \$100,000. Incorporators: H. A. Axline, C. McDonald, G. W. Hitt, J. B. Johnson and E. M. S. Huston.

The White Oaks Electric Company, Santa Fe, N. M.—to construct telegraph, telephone and electric railway lines.

divided into 500,000 shares of the par value of \$1, of which \$400,000 will remain as working capital. This company is building very handsome carriages and runabouts. One of the accompanying cuts shows a \$550 Stanhope model, which makes a very elegant appearance. The motive power consists of a 4 hp. gasoline motor, also manufactured by the company, which weighs exactly 83 lbs. The running frame of this carriage is built upon sound principles. The frame consists of two rectangular forms lying parallel to each other and held together by a brazed joint. This is mounted upon the axles in the rear by two strong clamps and on the front by a king bolt running from rear to front, allowing the frame

description, as it only measures 11½ x 5 x 6 inches and weighs only 20 lbs, complete with all necessary attachments and accessories, and the general principle of mounting to bicycles is accomplished by having a couple of rear stays and bracing motor to the rear wheel. No knowledge of machinery is required to do this. As to transmitting the power, this is accomplished by a friction wheel, which grips the tire of the hind wheel, and by two sprockets the speed is obtained; loosening one small bolt disconnects the motor and the rider can pedal if he so desires—The 1 hp. motor s-lls for \$75 and \$100, complete, ready for attaching to bicycle.

The company claims that all Crescent vehicles, bicycles and



CRESCENT 4 HP. MOTOR.

Capital stock, \$10,000. Directors: Paul Mayer, Robert E. Lund, George L. Ulrich, Jones Taliaferro and John Y. Hewitt.

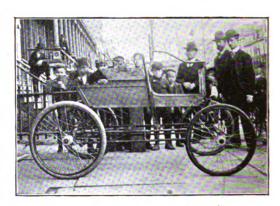
The Shoenberg Electrical Company, San Francisco, Cal.—to do an electrical supply business. Capital stock. \$20,000. Incorporators: A. S. Wadleigh, of Oakland; M. H. Shoenberg, G. A. Gott, L. Arzuer, H. Shoenberg, all of San Francisco.

The Manchester Light, Heat & Power Company, Manchester, Va.—to manufacture and sell gas, electricity, heat, etc. Capital stock. \$50,000. Incorporators: A. L. Anderson of Bon Air, G. E. Gary, A. J. Daffron, W. P. Mathews, A. Royall, E. H. Wells and C. Vadon, all of Manchester.



CRESCENT STANHOPE, \$550.

on which the machinery is attached to remain on a level plane, regardless of the angle of the wheels. The steering gear is controlled from the carriage to the front of the front axle, and by its peculiar mechanism allows the gear to be locked, thus doing away with the oscillation of the front wheels, which has heretofore been one of the prominent defects of the other style of automobiles. Other special features worth mentioning are the continuous axle on the rear wheels on which the compensation gear is mounted; by causing a shoulder thereon it is able to get an unequal speed in turning corners, and the motor being mounted upon the frame on wooden seats does away with the vibration now found in other vehicles operated by gasoline. In the transmission gear has been accomplished, it is said, what others



No. 2 STANHOPE, \$650.

tricycles can climb a 15 per cent. grade, and it is now building motors from 1 to 5 hp. in quantities for immediate delivery. The inventor, Mr. M. E. Toepel, supervises the motor department, and under his able direction first-class workmanship is guaranteed. The noted expert on automobiles and motors, Mr. Walter K. Freeman, is doing the company's drawing and designing. (n the first of May several carriages were completed and the company is now working hard to complete 25

Some very able men are interested in this company, prominent among them being Mr. Henry Cohen, of 66 Grand street, formerly at 604 Broadway, New York City, and his energetic methods in the managing of this company has brought it to this favorable condition, and while he is at the head of this



corporation there is no doubt that it is assured an enterprising, reliable and successful management. Mr. John Kelly, the treasurer is also a business man of repute, having large boot and shoe houses in Amsterdam, Sharon Springs, and >t. Johnsville, N. Y. Mr. G. W. Dorsey, the secretary, is a wellknown and successful man of Wilmington. Del, and is now the manager of the Delaware office of the Realty & Trust Co., in this city. Mr. Ellis, the manager of the carriage building department, has had experience for over 20 years in one of the largest carriage factories in this country.

#### ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 502-504 Broadway, New York City, N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and tills of invention wanted.

#### LETTERS PATENT ISSUED APRIL 24, 1900.

#### ELECTRIC RAILWAYS AND APPLIANCES.

ELECTRIC RAILWAYS AND APPLIANCES.

647,082. Electromagnetically Operated Railway Switch.
Frederic E. Baldwin, New York City. Filed Dec. 12, 1899,
648,067. Third-Rail Insulator. Edwin W. Rice, Jr., Schencetady, N. Y., assignor to the General Electric Company of New York. Filed Feb. 20, 1900.
648,081-648,082-648,083-648,084-648,085-648,086. Electric Rail-Bond. Constant F. de Redon, New York City, assignor to the Westinghouse Electric and Manufacturing Company. of Pennsylvania. Filed Aug. 24, 1899
648,092. Electric Signaling System for Railway-Track Switch.
Phillip B. Williams, Washington, D. C. Filed Oct. 5, 1890.
648,252. Electric Signaling System for Railways. Manious Garl, Akron, Ohio. Filed Nov. 28, 1899.
648,305. Car-Fender. Eben S. Saunders and James A. Rodman, Olathe, Kan. Filed Sept. 26, 1899.

ELECTRIC LIGHTS AND APPLIANCES.

#### ELECTRIC LIGHTS AND APPLIANCES.

648,144. Electric-Lighting Apparatus. Rufus N. Chamber-lain, Depew, N. Y., assignor to Charles M. Gould, New York City. Filed Nov. 20, 1899.

295. Electric-Arc Lamp. William E. Pugsley, Lincoln, Neb. Filed Sept. 29, 1899,

# ELECTRICAL MACHINERY AND APPARATUS, 648,273. Brake for Electric Motors. Charles A. Lindstrom, Chicago. III. assignor, by direct and mesne assignments, to the Hewitt-Lindstrom Motor Company, same place. FiledNov. 16, 1869.

MISCELLANEOUS.

647,940. System of Train Control. Harold W. Buck, Schenectady, N. Y. assignor to the General Electric Company of New York. Filed Feb. 1, 1899.

647,946. Electric Igniter for Gas-Engines. Walter H. Cotton, Chicago, Ill. Filed June 26, 1899.

647,960. Electrolytic Cell. George W. Gesner, New York City, assignor to Harleston Corbelt Gesner, same place. Filed Dec. 15, 1899.

647,970. Apparatus for Indicating Leakage of Current from Electric Conductors. Martin Kallmann, Berlin, Germany. Filed Dec. 27, 1898.

531, 970. Apparatus for Indicating Leakage of Current from Electric Conductors. Martin Kallmann, Berlin, Germany. Filed Dec. 27, 1898.
547, 975. Support for Electric Conductors. Thomas J. Cope, Philadelphia, Pa. Filed Feb. 2, 1900.
547, 980. Electric Elevator. James F. Morrison and Orlando M. Woodrow, Wellston, O., assignors. by mesne assignments, of one-half to Robert F. Goddard and Ellsworth E. Moran, same place. Filed April 10, 1899.
548, 009. Maximum-Meter. Henry O. Westendarp, Saugus, Mass., assignor to the General Electric Company of New York. Filed Feb. 28, 1900.
548, 052. Brush-Holder. Edward D. Priest, Shenectady, N. Y., assignor to the General Electric Company of New York. Filed Jan. 27, 1900.
548, 1032. Steering Device for Automobiles. Joseph H. Pope, Brockton, Mass. Filed Nov. 4 1899.
548, 128. Electric Igniter for Explosive-Engines. William F Davis, Waterloo, Ia., assignor to the Davis Gasoline Engine Works Company, same place. Filed May 22, 1899.
548, 174. Insulating-Coupling Device. Oscar W. Meyrowitz, New Rochelle, N. Y. Filed Feb. 27, 1900.
548, 369. Electric Clock, Peter M. Ravenskilde, Cabery, Ill. Filed April 7, 1899.
548, 348. Method of Treating Carbide of Calcium. Chas. E. Yvonneau, Paris, France. Filed June 30, 1898.
548, 350. Prepared Calcium Carbide. Chas. E. Yvonneau, Paris, France. Filed June 30, 1898.
548, 750. Telephone-Instrument Wall-Case William D. Charly.
557. Telephone-Instrument Wall-Case William D. Charly.

DESIGN.
32,597. Telephone-Instrument Wall-Case. William D. Gharky
Philadelphia, Pa., assignor to the Sun Electric Manufacturing Company of New Jersey. Filed Feb. 17 1899.

#### AUTOMOBILES.

Baltimore, Md.-The Automobile & Manufacturing Company of this city has recently turned out its first electric delivery wagon. It will carry 1.200 pounds and is equipped with a four and one-half horse power motor which is capable of an overload of 150 per cent. There is also a battery of 100 amperes, 80 volts capacity. The new wagon has been tested on cobble-stones, belgian blocks and asphalt, and it is stated, can move up any bill in the city faster than a horse drawn vehicle. any hill in the city faster than a horse-drawn vehicle. The speed on a level is 12 miles an hour. The first test made was satisfactory.

### GENERAL NEWS.

What is Going On in the Electrical World.

#### LIGHTING.

Baltimore, Md.-The board of directors of the Maryland Penitentiary is considering plans for the improvements at the institution, for which the Legislature recently granted \$150,000. The first work will be the wiring of all buildings from the electric plant. Electricity will be used to furnish light, heat and power to all the shops.

Bowling Green, Ky.—M. H. Crump, secretary of the Commercial Club, is in the market for a 5,000 incandescent light plant.

Cass Lake, Minn.-General A. Hughes of Fargo, N. contemplates establishing an electric light plant at this place.

Clinton, Ia.—Plans have been prepared for a new electric light and heating plant for the State University to cost \$25,000.

Florence, S. C.—The Florence Improvement & Manufacturing Company, which owns the electric light plant in this city with J. P. Chase as manager, contemplates making extensive improvements at an early

Fort Collins, Col.-A special committee has been appointed to consider the question of electric lighting of this city, and the feasibility of municipal ownership.

Fort Totten, N. D.—The appropriation for an electric light plant at this place will be increased \$4,000.

Griswold, Ia.—Messrs. Seeley & Haggemeister con-template the erection of a new electric light plant.

Hagerstown, Md.—This city will build a ₹49,000 electric light plant. Plans and specifications will soon be prepared. Address J. W. Recher, clerk.

Pine City, Minn.—The Richardson Electric Company of Duluth, Minn., has purchased the electric light plant at Pine City and will make a number of improve-

The Philadelphia & Reading Railway Reading, Pa.resuling, ra.—Ine rinadelpina & resuling hanway proposes a new departure from end to end of its system in the way of establishing a complete series of electric light plants to take the place of existing methods, and to meet a situation that has long been a necessity. Eilis E. Brown is the electrical engineer.

Red Bud, Ill.—It was voted recently to appropriate \$10,000 for the purpose of erecting an electric light

Sacramento, Cal.—Plans are being prepared for the erection of a new electric light plant for this city.

San Francisco, Cal.-City Engineer Grumsky will soon receive bids for erecting a municipal electric light

Snow Hill, Md.—Bonds are to be issued to build an electric light plant here.

Weatherford, Tex —The city council has granted a franchise for an electric light plant to J. L. Sales of Dallas, Tex.

## STREET RAILWAYS.

Columbia, Pa.—Work on the Montour-Columbia Electric Railroad, which will connect Danville, River-side, Bloomshurg, Espy, Berwick and Nescopeck, will begin soon. The surveys have been made, and bids for its construction are invited.

Chicago, Ill.—Electricity will take the place of the horse cars on the State street and the Wabash avenue and Cottage Grove avenue lines of the Chicago City

Escanaba, Mich.—The directors of the Escanaba Electric Railway have decided to extend their line from this city through Gladstone to Rapid River, a distance of twenty miles.

Lackawaxen, Pa.—The State Railroad Commissioners recently granted to the Delaware Valley & Kingston Railway Company the right to build an electric road along the line of the old Delaware & Hudson Canal. It will extend from this place to tidewater at Kingston, N. Y. The New York line will be 81 miles long, to be operated in conjunction with a line in Pennsylvania 16 miles long, extending from Lackawaxen to Hawley, where it will connect with the Eric & Wyoming Railroad.

Lewinsville, Va.—A suburban railroad project is being worked out which, it is expected, when all the plans are realized, will result in the building of an electric road from the Virginia end of the Aqueduct bridge through Virginia toward the north, following the banks of the Potomac, although at some distance from the shore line, to the Great Falls. At this place it is proposed to build a line that will extend to Fairfax Court House, passing through Vienna and other towns on the Southern Railroad.

Milford, N. H.—A survey is to be made for an electric road from here to Mt. Vernon.

Parkersburg, W. Va —The directors of the Ohio Valley Electric Railway Company have awarded the contract for the construction of an electric road from Catlettsburg. Ky., to the upper end of Central City, W. Va., to Kerr, Fox & Co., of Huntington. The company is constructing electric lines throughout the entire valley.

Rushville, Ind.—H. Probasco, of Cincinnati, has been here looking over the field for an electric car line from Rushville to Indianapolis.

Washington, N. J.—The village council recently granted a franchise for a trolley road through this village to the Philipsburg Horse Railroad Company.

#### MANUFACTURING.

Baltimore, Md.—The Automobile & Manufacturing Company has received an order for about \$40,000 worth of machines from the American Autocarrette Company of Washington, D. C.

Boston, Mass.—The National Electric Hose Signal Company of this city was recently organized with a capital of \$150,000, for the purpose of manufacturing and selling electric hose batteries, wires and signals.

Camden, N. J.—The Sun Electric Company proposes to locate a plant in this city, where it will manufacture electrical appliances and employ about 600 hands.

Mansfield. O.—The Aultman-Taylor Company of this city has the contract for furnishing the latest improved Babcock & Wilcox boiler for the new electrical power plant of F. E. Myers & Bros. of Ashland, O.

New York City.—The Beberts Battery Company of this city, of which Edmund Tweedy, of 11 Broadway, and Isaiah L. Boberts are the directors, will manufac-ture electrical machinery and batteries on a capital of

Philadelphia, Pa.—The Rumsey Manufacturing Company of this city is to furnish the electrical supplies for the electric light plant at Pulaski, Va.

#### COMPANY MATTERS.

Beaver, Pa.—A party of New York capitalists has been here negotiating for the purchase of the Beaver Valley Traction Company's lines, the line of the Riverview E'ectric Street Railway Company, and the plant of the Patterson's Heights Incline Plane Company.

Gloucester City, N. J.—The Gloucester City Electric Light Company changed hands yesterday, having been purchased by the American Investment Com-

Kansas City, Mo.—The Edison Electric Light Com-Kansas City, Mo.—The Edison Electric Light Company and the Kansas City Electric Light Company of this city, and the electric companies of Kansas City, Kan., have been consolidated into two companies—the Kansas City Electric Light Company in this city and the Consolidated Company across the line. The capital stock has been increased to \$2,500,000 for both companies. Contracts for \$500,000 worth of new machinery to be placed in the Riverview power house have recently been closed.

Pittsfield. Mass.—A site for the proposed new shops of the Stanley Electric Manufacturing Company has recently been secured in the Morningside section of this city.

Richmond, Vs.—The Bichmond Passenger & Power Company is now in possession of all the electric lines in this city and Manchester except those controlled by the Traction Company. The lines are to be reconstructed, and better service is promised.

Shenandoah, Ia.—The city council recently granted the Electric Light & Power Company permission to use the streets and alleys for the purpose of installing a hot water heating plant.

Tarrytown, N. Y.—The Hudson River Gas & Electric Company of Westchester County, has been absorbed by the United Gas & Improvement Company of Philadelphia. It is claimed that the plant is to be improved and extended.

### POWER AND TRANSMISSION PLANTS.

Gaffney, S. C.—Plans are being perfected for the development of Gaston Shoals, near here. H. D velopment of Gaston Shosis, near here. H. D. Wheat, president of the Gaffney Manufacturing Company, has purchased that property with a large tract of land on either side of Broad River, and is now organizing a company to develop the water power. Au electric power plant will be installed and power transmitted to this place and Spartanburg and other nearby towns, while several towns will be furnished with electricity for lighting purposes

Hinsdale, Mass.—An electrical engineer has lately been looking over the lower Plunkett water privilege at this place, called the Jerico dam, with the view of using the power for a plant for the proposed Dalton-Hinsdale electric road and to furnish light and power for these two places. The water supply is one of the best on this branch of the Housatonic River and with the Plunkett and Ashmere reservoir it can be made one of the best locations for a plant in this section.

San Jose, Cal.—The Standard Electric Company, which has its plant at Blue Lakes, Alpine County, is preparing to begin active operations in San Jose and Sants Clars Counties. In this city an immense storage plant will be erected, so that in case of an accident the company will have sufficient power to last for several days. Nearly all the country towns will be supplied, and farmers and fruit growers will be able to make use of the power.

St. Paul Minn —The St. Croix Power Company is

St. Paul, Minn.-The St. Croix Power Company is constructing a power house at Apple River for the transmission of electricity to this city. It will take about a month to complete the dam. Power will be furnished late in July.



# THE TELEPHONE WORLD.

#### May Fight the Bell Again.

A dispatch from New Orleans, La., states that there is considerable talk of organizing an independent telephone company to take the place of the defunct People's Company, and to continue the fight against the Bell monopoly, operated under the name of the Cumberland Telephone & Telegraph Company. The present plan is to have the new company controlled by the city in a manner similar to that proposed in Chicago.

Two years ago an independent company was organized by Detroit men, which styled itself the People's Company, and bonds for \$400,000 were floated for the purpose of establishing the new company's system.

ing the new company's system.

The people of New Orleans, who were tired of the high rates, and the despotic actions of the Cumberland Company, gave the People's Company every possible encouragement, even to the free use of the streets.

The new company set up its lines, reduced the rates considerably, and was giving a satisfactory service in every way, when it was suddenly announced that it had sold out to the Bell Company. The monopoly was re-established and rates were raised to the old level.

Referring to the plan of the Massachusetts Telephone Company to construct a long distance trunk line telephone system from Boston to Chicago the Springfield, Mass., "Republican" "There is a syndicate of 10 New York capitalists behind the plan, and there is said to be \$50,000,000 back of it. An effort will be made to buy out the New England Telephone & Telegraph Company's system in Massachusetts and Northern Rhode Island and Southern Vermont and New Hampshire to the New York State line. A bid will be made for the American Bell Company's system through New York and Massachusetts. The Massachusetts Telephone & Telegraph Company, which has been striving to obtain franchises from Boston to the western edge of the State, will be the Massa, chusetts end of the big system. The syndicate proposes to build a 40-wire trunk line through to Chicago. The company is prepared to offer to the people of Massachusetts telephone rates 60 per cent. lower than those granted by the established companies."

At a recent meeting of those interested in the Farmers' Telephone Company of Canastota, N. Y., a stock company was formed with a capital stock of \$1,000, with the idea of increasing shares at \$25. The directors chosen were: R. D. Button, Cyrus Warlock, Milton Jennings, Charles Taber, H. R. Murray, John Souter and D. C. Twogood. The line proposed to be set up will run from Perryville through Canastota to South Bay, Sylvan Beach, Oneida Lake and Lakeport. Each subscriber of stock buys his own telephone, and receives free service. Another meeting is to be held soon, when further arrangements will be made.

The Northville (Mich.) Telephone Co. has contracted with Chicago parties for the construction of a new switchboard for its central office. It will be of the very latest improved patent, wired for either metallic or ground circuits or both and will be of sufficient capacity to accommodate 200 subscribers. The Northville Company was organized about three years ago and now has 100 subscribers, with a number of orders ahead awaiting the advent of the new board. The local rates are 50 cents to \$1 per month and the company gives both night and day service.

Advices from Norton, Kan., state that most of the county seats of northwestern Kansas are agitating the question of putting in a telephone line connecting the various places, giving also the smaller towns connection with the county seat. All crops have yielded so bountifully within the last few years that the leading farmers find themselves amply able to have conveniences, which, if suggested in the short grass country a few years ago, would have been laughed at,

The city of Bessemer, Ala., has passed an ordinance granting to S. B. Claypool, his associates and assigns, the right to the use of the streets and avenues of the city of Bessemer for the purpose of erecting poles and other necessary appliances to be used in maintaining a telephone system. One of the principal conditions is that not more than \$3 per month shall be charged for business houses, nor more than \$1.50 for residences.

At a meeting of the county board of assessors at Wood bury, Pa., recently, it was agreed to assess the poles and wires of the different trolley lines and telephone companies. The plan adopted is to send to these companies and get their valuation, and if this is not furnished the assessment will be made at the assessors' valuation.

The advisory board of the Independent Telephone Association of the United States has fixed the annual meeting for Cleveland on June 12, 13 and 14.

#### Detroit and Marquette Service Established.

Long distance telephone service between Detroit and Marquette, Mich., has been established by the Michigan Telephone Company. The construction of the new line was pushed right through the winter and a few days ago the last mile of wire was strung between Petoskey and Mackinaw City. The line from St. Ignace to Marquette was finished some weeks ago, and as the cable across the straits was laid last fall, all that remained to be done was to connect the circuits and clear up certain details of equipment to put the service in good shape. Satisfactory conversation has been held between Detroit and Marquette, and tests have also been made between Marquette and Cleveland, Marquette and Pittsburg, Pa., etc.

The line is an unusually long one when it is considered that connection is made at the straits with the longest submarine cable in the United States.

E. D. Trowbridge, general superintendent of long distance service, is reported as saying:

"We are building a line from Marquette to Houghton and another line from St. Ignace to Sault Ste. Marie. These lines we hope to have in operation by June 1, so that within five or six weeks we shall have connection with all important stations in the upper peninsula. The line just opened gives us connection with St. Ignace, Trout Lake, Soo Junction, Seney, Newberry, Marquette, Michigamme, Ishpeming, Negaunee, Republic and some ten or twelve other stations. The building of these lines is of considerable importance in the telephone world, and the lines are of much more importance to the subscribers of the Michigan Company in opening up a lot of new territory. There are several hundred Detroit people who have a financial interest in the new lines. The Michigan Company had a large number of local stockholders, and through the recent consolidation with the Detroit Telephone and New State Telephone Companies added over 1,400 Michigan people to its list of stockholders, making a total of probably 2,000 residents of the State that are now stockholders in the company."

J. Kajiura, of Tokio, Japan, an electrical engineer, who has been studying the different systems of the telephone and telegraph in Europe for the benefit of his Government, is now in Chicago. Mr. Kajiura is connected with the department of communication of the Japan Government. In the last year he has visited the principal cities of England, Scotland, Ireland, France, Switzerland, Italy, Germany, Austria-Hungary, Belgium and Holland. He arrived in New York two weeks ago. He will remain in Chicago ten days studying the telephone and telegraph systems there. Mr. Kajiura says America has the best telephone system, and England the best telegraph. In Japan the Government owns both these systems. On this account the extension and improvement of the systems is very slow, as nothing can be done without an act of Parliament. The Government appropriates a certain sum each year, and the expenses of operation and improvement must not exceed this sum. Mr. Kajiura thinks Government ownership of these lines in this country would cause great dissatisfaction, inasmuch as Americans would not be willing to wait for Congress to act every time an extension of service was required. While he finds the telephone subscription charges much higher in America than in England and on the Continent, he says the service is much more comprehensive, and in reality quite as

The Black River Telephone Company, now doing business in this State, is said to be meeting with great success. The company was incorporated under the laws of the State of New York with a capital of \$25,000. The directors for the first year are H. C. Markham, of Lycn's Falls; Benedict Gantner. Pasadena; F. C. Myers, West Leyden; David Swancott, Lee Center; Frank Harrington, Delta; S. C. Capron, Leyden; Philip J. Domser and John J. Domser, Boonville, Officers for the first year are H. C. Markham, president; B. Gantner, treasurer; S. C. Capron, secretary; F. C. Meyers, vice-president; John J. Domser, general manager.

The Rawson Electric Company of Elyria, Ohio, turned over the Home Telephone Company plant to the Home Company of Niagara Falls on May 1, at which time the concern began business with a completed line. The Home Company started business with over 500 subscribers. Conferences are being held between the Home and Bell Companies, and it is likely that some agreement will be reached in the near future.

The village of Jacksonville, Vt., will soon be connected by telephone with Heath, Charlemont, Shelburne Falls, Colrain and other places.

Excavations are progressing for the new long-distance telephone building to be erected in Lansingburgh, N. Y.

## An Automatic Pay Station Telephone Attachment.

Ever since the more general introduction of the telephone, there has been a demand for an arrangement whereby the unlimited service rendered the public can be served at a profit instead of a loss to the telephone companies, and while some attempts have been made to solve the problem, the result was generally a large complicated and expensive piece of apparatus requiring usually an extra set of batteries for operation.

Every telephone company has more or less felt the loss of placing telephones in public places which are used by others than the subscribers without compensation of any kind for the service rendered. The Dinsmore Automatic Pay Station Telephone Attachment not only stops free service but makes it possible to place telephones in places where there has been a demand without a subscriber. It makes each user pay for the use of the telephone.

The Dinsmore attachment is devised for use with any telephone or system, and made in two styles: A for receiving a nickel, and B to take a 25-cent piece. If toll is 5 cents, drop single coin; if 10 cents, drop two 5-cent pieces. The mechanism is simple and durable, nothing to get out of order. nothing to wear, and is enclosed in iron case with slot opening at top sufficiently large for a 5-cent piece or a quarter. It is fitted with a Yale lock, making it secure from intrusion. It is simple to operate and easy to attach, and once placed it requires absolutely no attention except the collection. A connection cannot be made until after coin has been deposited, which notifies the operator to connect.

One great advantage is, that it does not require any extra battery, being connected in multiple with the transmitter in the primary circuit of the induction coil.—The "Telephone Magazine," Chicago.

The Hudson River Telephone Company has purchased property adjoining its present building in Albany, N. Y., and will erect a large addition, making the building 46 feet on Chapel street and 88 feet on Maiden Lane. The addition will be granite and five stories in height. The work will be commenced June 1 and is expected to be finished by November 1. The company has in Albany about 3,150 telephones, and they are increasing at about 100 per month.

Bell telephone gossip from Boston asserts that the first year after the exchange of stock into that of the Long Distance Company is effected, will see \$10.50 paid on each share. That is, the two shares which will be given for one share of Bell will get \$7.50 in dividends, 6 per cent, regular and 1½ per cent. extra, and the right to subscribe for new stock is figured at \$3, with more rights to follow in future years.

The Eastern Telegraph & Telephone Company, which was recently incorporated in Trenton, N. J., proposes to be a strong rival and competitor to the Bell Telephone Company. One of the first places they will start the fight is in Camcen, Judge E. A. Armstrong, former city counsel J. Willard Morgan, John J. Burleigh and ex-Sheriff Daniel Baird are among the principal stockholders. The company promises cheaper telephone service.

The proposed city charter fixes telephone rates in Minneapolis at \$48 per year for business 'phones, and \$24 a year for telephones in residences. These rates are far less than those now charged by the Minneapolis companies. Everywhere the story is the same. Where there is no competition the rates are higher than where there is.

#### TELEPHONE INCORPORATIONS.

The Centralia Telephone Company, Centralia, Mo. Capital stock, \$6,000. Incorporators: J. A. Chance and A. Bishop Chance.

The Eastern Telegraph & Telephone Company—to operate lines in New Jersey. Capital stock, \$250,000. Incorporators: J. W. Morgan, John J. Burleigh, and E. A. Armstrong of Camden, N. J.

The Franklin County Telephone Company, Malone, N. Y. Capital stock, \$8,000. Incorporators: E. B. Ferensen, J. A. Crawford, M. S. Crawford, N. S. Ferensen, John Chambers, R. L. Crawford of Hamden, and Frederick C. Ward, Delhi.

The McKin Telephone Company, St. Mary's W. Va. Capital stock, \$50,000. Incorporators: R. H. Browse, O. Gorrell, B. F. Sockman, A. Eddy, W. C. Dotson, all of St. Mary's.

The Overton Telephone Company, Livingstone, Tenn.—to conduct a general telephone business. Capital stock, \$5,000. Incorporators: H. Hatcher, M. Miller, H. R. Vaughan, R. H. Hawkins, W. H. Hawkins, all of Livingstone.



## SECURITIES. **ECTRICAL**

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electrical Securities dealt in at the leading commercial centers are compiled from special reports. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar, guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mig., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. &. A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

## STOCKS.

PASSE	N	GER R	AILW	ays.			PASSE	NG	ER R	AILW	AYS.				
FAICE.	Par	Capital Stock.				Bate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Capital Stock.		Bate and Date of Last Div.	Bid.	A=ke <b>G</b>
Albany, N Y≺ 30. United Traction		<b>∌</b> 5, <b>000,00</b> 0	: 5 000 000	1½ % Q.,	128	12414	Hartford ConnApr 30: Hartford Street Ry. Co Hartford & West Hartford RB		\$4,000,000 1,000,000	\$200,000 247,000	8 % 8., Oct., '98.	150	=		
Troy City Railway.)							Holyoke Mass.—Apr 30. Holyoke Street By. Co	100	400,000	400,000	8 % A., June, '98.	2073	212		
Allentown PaApr 30:							Hoboken, N. JApr 80.			•					
Allentown & Lehigh Val. Trac. Oo		4,000,000	1,500,000	*********	••	15	North Hudson Oo. (N. J.) Ry. Co Indianapolis. Ind-Apr 30.	. 20	1,250,000	1,000,000	8 %, 1892.	150	-		
Bridgeport, Conn-Apr 30: Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	105		Indianapolis Street Ry	.	5,000,000	5,000,000		33	831/4		
Baltimore 'MdApr 30 a United Rail ways & Elec. Cocom	. 54	24,000,000	18,000,000	***************************************	181/4	18½	Lancaster, Pa.—Apr 30 Pennsylvania Traction Co Lancaster & Col. Electric Ry	100	10,000,000	9,900,000 87,500			-		
Boston, Mass.—Apr 30 New England Street Ry	100 100 50	4,000,000 2,000,000 10,000,000	4,000,000 2,000,000 9,085,000 6,400,000	1 % Q., Jan.15, 6 % S., A. & O. 8% % S., Oct., 's9 4 % S., Jan. 2% % Aug. 99,	15 85 93 112 144 ½	16 87 94 114 145	West End Street Reliway  Louisville, Ky.—Apr 30: Louisville Ry	100 100	4,000,000 2,500,000	8,500,000 2,500,000	1½ %., April '98, 2½ % S., Oct. 1, '98	78 110 633/s	79 111		
Brooklyn N. Y.—Apr 30: Brooklyn City Ry	.	200,000	200,000	***********	735 735 107 247	235 735% 109 289	Twin City Rapid Transitcom Twin City Rapid Transit	50		1,712,200 4,000,000	1¾ % Oct., '98. 8 % 8., M. & N. 1½ % 8., J. & J.	255 96/ <sub>9</sub>	256		
6Brooklyn, Queens Co. & Sub. RR. Coney Island & Brooklyn RR Kings County Elevated	10	2,000,000 2,000,000 4,750,000	2,000,000 1,884,200 4,750,000	25 % Nov., '59	325	330	Memphis Tenn.—Apr 30: Memphis Street Railway Co			500,000		25	_		
Kings County Traction Copfd. Nassau Electric Railroadpfd. /Atlantic Avenue Railroad gBrooklyn, B. & W. E. Railroad	100	6,000,000 2,000,000	6,000,000 2,000,000	• • • • • • • • • • • • • • • • • • • •	75	80	New Haven, Conn.—Apr 80: Fair Haven & Westville RR New Haven Street Railway Co	20	1,250,000	2,000,000 1,000,000 800,000	8 % S., Sept. '98. 2% % A., July '96.	89	41		
Buffalo N. Y.—Apr 30: Buffalo & Niagara Falis Elec. By Buffalo Railway Co	10 10		1,250,000 5,870,500	1 % Q. Dec., '19	74 99	75 100	Winchester Avenue RR  New Orleans, La.—Apr 30	. 25		600,000	••••••	15	46		
Columbus O.—Apr 30. Columbus Street Railroad Columbus Stree Bailroad, pfd	. 10	8,000,000	8,000,000	1 % Q., Feb.	26 85	28 88	Canal & Clatborne RR. Co New Orleans & Carroliton RR New Orleans Traction Co new ord New Orleans Traction Co. new ptd	100 100 100	1,200,000	1,200,000	4 % 8., July, '98.	148 % 22 % 55	24 96		
Charleston, S. CApr 30 Charleston City Ry. Co				8 % 8.		::	aCrescent City RRguar bNew Or. City & Lake RRguar Orleans Railroad St. Charles Street Railway	100	2,000,000 500,000	2,000,000	8 % 8., Jan., '99. 4 % 8., Jan., '99. 1½ %., June, '94. 1½ %. Oct., '98.	20%	52		
Chicago, Ill.—Apr 30 Chicago City Ry. Oo. Chicago & South Side R. T. RR. Lake Street Elevated RR. Metropolitan West Side Elev. Ry. Met. West Side El., pfd. North Chicago Street RR. hNorth Chicago City RR. South Chicago City Railway. West Chicago St. RR. Oo. Union Traction Ry	10 10 10 10 10 10 10 10	0 10,828,800 0 10,000,000 0 15,000,000 15,000,000 0 10,000,000 0 2,000,000 0 20,000,000	10,828,800 10,000,000 7,600,000 9,000,000 6,600,000 249,900 1,608,200 18,189,000	Feb 28 1900.  8 % Q., Jan.  11/4 % Q., Feb.	261 8, 27 +0% 221  110 24 70%	28 101/2 227  26	New York—Apr 30: Cantral Crosstown Rk cChristopher & 10th Sts. RRguar Dry Dock, E. Brdw'y & Bastiery RR dMetropolitan Street Ry. Co cBleecker St. & Fulton Fy. Ry. gua fBroadway & Seventh Ave guar gCen. Park, N. & E. Rivers RR. gua hEighth Avenue RR jNinth Avenue KR gua iSixth Avenue RR gua iTwenty-third St. R. R. Coguar	. 100 . 100 r 100 r 100 r 100 r 100 r 100 r 100 r 100	900,000 2,100,000 1,800,000 1,000,000 750,000 800,000 2,000,000	900,000 2,100,000 1,800,000 1,000,000 748,000 800,000	2½ % Q. 2 % Q., Oct., '98. 1½ % Q., Nov., 98. 2½ % Q., Feb., 1900 34 % A., July, '98. 2½ % Q. 4½ % Q.	270 175 100 157 84 235 119 895 395 198 -05 400	800 185 12412 15754 37 2 0 200 4.0 4.0 205 210 4:5		
Cincinnati, Ohio.—Apr 80: Cincinnati Inc. Plane Bycom Cincinnati Inc. Plane kypfd Cincinnati, Newport & Oor. St. Ry Colucinnati Street Ry. Co	10	0 150,000 0 1,000,000	150,000 8,500,000	%% Feb. 2%% Feb. 14% Q., Jan.	83 1243	 89 125	Third Avenue RR	. 100 100 7 100 . 100	2,500,000 12,000,000 2,500,000 2,000,000	1,862,000 10,000,000 2,500,000 2,000,000	) 2 % Q., Jan,, '99.   \$1.75 p. sh. Feb. 99	190	201 108 60 200		
Mt. Adams & Eden Park Inc. Ry Cleveland, Ohio.—Apr 30: Agron, Bed. & Olev. Elec. By Oleveland City Ry Oleveland Electric By	10	0 2,500,000 0 1,000,000 0 8.000.000	1,000,000 7,600,000	1% % Q., Jan. 3/ % Jan. 8-5 % Jan. 2/4 % Q., Oct., '99	48 100 87	50 101 £8	Consolidated Traction Co. of N. J North Jersey Street Railway Co United Electric Co. of New Jersey Pittsburg, Pa.—Apr 30; Allegheny Traction Co	100	504,000	6,000,000 <b>504,00</b> 0	1154 % A.	60 28 22 55	28×		
Detroit Mich.—Apr 30. Detroit Citisens' Street Ry Fi. Wayne & Belle Isle Ry Rapid Rallway Co Detroit Electric Railway Wyandotte & Detroit River Ry	10	2,000,000 250,000 1,000,000	1,250,000 1,200,000 250,000 1,000,000	•••••••	1003 175 90 	i00 i10	oConsolidated Traction Cocom Consolidated Traction Copfd pCentral Traction Co qCitizens' Traction Co rDuquesne Traction Co sPittsburg Traction Co Federal St. & Pleasant Valley Ry.	50	15,000,000 1,500,000 8,000,000	15,000,000 15,000,000 [900,000 18,000,000	2 %, Jan., '95. 8 %, Nov. '98. 11/2 % Nov. 7, '98. 6 % A.	25¾ 64¼ 69 70	641/2 70 71		
Dayton O.—Awr 30 City Railway Cocom City Railway Copfd People's Street Railway	10	0 1,500,000 0 600,000	1,470,600 600,000	1½ % Q. 1½ % Q.	140 170 114	145 115	Pgh., Allegheny & Man. Trac. Co P'itsourg & West End Ry. Pitsburg & West End Ry. United Traction Cocom United Traction Copref	50 25 50 50	8,000,000 8,000,000 1,500,000 17,000,000 8,000,000	12,994,889 8,000,000 1,500,000 17,000 000	10 % A. 18½ %, Nov. 7, '98, 12½ %, July, '98, 12%, Aug., '95, 11 %, Oct. '98, 15 % A., June 80, 98 J. & J. J. & J.	41 14 511/4	1254 1454		

\*Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltin ore. The pref stock of U R & E ec. Co. has been issued in the form of income bonds. b Leased to B ston E evated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Helphts Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Hrooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co. f Stock owned by Kings County Traction Company; road operated by Brooklyn Hts. Co. f Stock owned by Kings County Traction Company; road leased to Nassus system.

h \$30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; 250 100 of stock owned by North Chicago Street Railroad Company.

i Controls by lesse Chi-ago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j 85 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$625,100 of stock owned by West Chicago Street Railroad Company.

h Majority of stock owned by Chicago West Division Railway Company; 5% on \$1,000,000 took guaranted by West Chicago Street Railway Company, lessee.

Cincinned St. Railway purebased the Mt. A. & Eden Park road, assuming the bonds.

- Unlisted. † Full paid. 1 Outstanding. ‡ Ex-div.
  a Leased to New Orleans Traction Company at 8 % on stock.
  b Leased to New Orleans Traction Company at 8 % on stock.
  b Leased to New Orleans Traction Company at 8 % on stock.
  c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.
  d Operating the former Med. Trac. system, that corporation having become extinct.
  c Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
  f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Ry.
  f Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
  h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.
  i Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.
  i Leased to Metropolitan Street Railway for 18 % on atock.
  l Leased to Metropolitan Street Railway for \$145,000 per annum.
  Leased to Metropolitan Street Railway for \$8 % on capital stock.
  m Controlled by Third Avenue Railroad by purchase.
  n Dividends of 12 % yearly guaranteed by Consolidated Traction Company,
  o Controls by lease the Alleg'ny, Cent., Oittzens' Duquesne, Fort Pitt & Pitt'h Traction.
  p Leased to Consolidated Traction Company for 6 % on \$5,000,000 capital stock.
  r Leased to Consolidated Traction Company for 6 % on apital stock.
  s Leased to Consolidated Truction Company for 7 % on capital stock.

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#### PASSENGER RAILWAYS. TELEPHONE AND TELEGRAPH COS. Capital Stock. Capital Stock. Bare and Date of Last Div. Bate and Date of Last Div. Par Authors'd Issued. Eid. Asked Par Authors'd Issued. NAME. NAME. New Bedford Mass-Apr 30 Boston, Mass. - Apr 30 100 50,000,000 28,650,000 4% % Q., Jan. 1, % Q., Feb. 20, 10,894,600 10,804,600 \$1.50 p. sb. Feb American Bell Telephone Co..... Eris Telegraph & Telephone Co.... New England Telephone Co..... 100 \$850,000 \$550,000 2 %, Feb. 160 165 9:312 1041 Northampton, Mass-Apr 30 170 178 Northampton Street Rv..... 100 800,000 225.000 4 % A., June, New York.—Apr 30 American Telegraph & Oable Co... \*Central & South Am. Teleg. Co... \*Commercial Cable Co... Franklin Teleg. Co... 2% % guar. Erle Telegraph & Telephone Co... \*Gold & Stock Telg. Co..guar. 6 %. \*International Ocean Tel Co.guar6% Mexican Telephone Co... \*Pactic & Atlantic Teleg. guar. 4 % \*Postal Telegraph Cable Co... \*Sout'n & Atlantic Telg. Co.guar. 5 % \*Commercial Union Telegraph Co... Western Union Telegraph Co... \*Div. guar. by Postal Teleg. Co. New York.-Apr 30 Omaha. Neb.-Apr 30: 91 104 165 42 112 118 116 55 65 Omaha Street Ry..... 100 5.000,000 5.000,000 3 % A. and N. 107 170 Paterson, N. J.-Apr 30. Paterson Ry. Co..... 100 1.250.000 1.250,000 128 118 27/4 162 75 Providence, R. I.-Apr 30: 8,000,000 3/4 %, Oct. '98 109 111 100 8,000,000 United Traction & Electric Co .... 8,728,000 2½ % Q., Jan., '99. 15,000,000 1 % Q. 559,525 2½ % 8. 500,000 8 % 8., Jan., '99. 97,870,000 1½ %, Q. Jan. '99 160 50 Philadelphia.-Apr 30 1,770,000 2 %, Dec. '\$9, 11,966,100 22% %, July 15, '\$9, 1533,900 8 % Feb. 1, '\$9, 76, 800,000 8 % Feb. 1, '\$9, 76, 99, 930,450 8,237,320 15,500 \$8 share Q. 11,875,000 \$14 sha'e A—Apr. 9 40 48 24 48 76 76 833 100 25 25 47 75 76 33 % :00 118 82 823<u>k</u> 500,000 Miscellaneous. - Apr 30: MISCEIIANEOUS.—Apr 30: American Dist. Teleg. (Phila.).... Beil Teleph. Co. (of Canada.)..... Chesapeake & Potomac Telep. Co... Chicago Telephone Co.... Central Dist Prig & Telg. Co. (Pgh.). Empire & Bay States Telegraph Co... Hudson River Telephone Co.... \*Northwestern Telegraph Co..guar Providence (R. I.) Teleph. Co..... Southern New Eng. Teleph. Co.... | 1,875,000 | 14 sha'e A—Apr. 19 | 150 | 1,000,000 | 1,000,000 | 1,771,075 | 39 share A, Mar. 98 | 30 | 1,005,000 | 1771,075 | 39 share A, Mar. 98 | 30 | 1,005,000 | 150,000 | 3%, A., April. 98 | ... | 150 | 1,500,000 | 150,000 | 3%, A., April. 98 | ... | 150 | 1,500,000 | 1774,000 | 1774,000 | 1774,000 | 1774,000 | 1774,000 | 1774,000 | 1774,000 | 150,000 | 150,000 | 150,000 | 150,000 | 150,000 | 150,000 | 150,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 | 1750,000 451 25 100 100 400,000 **8,**960,000 26 188 55 200 148 75 120 87 3,561,000 2 % B. 9036 62 210 150 76 125 125 95 750,000 750,000 100 151 152 2,000,000 2,500,000 2,000,000 1 % Q 2,500,000 234 % Q. 50 2,500,000 50 100 8,000,000 124 84% 963/4 157 ELECTRIO LIGHT AND ELECTRIOAL MFG. 008. 2081/4 Boston, Mass.-Apr 30: BOSTON, MASS.—Apr 30: Fort Wayne Electric trust receipts.. Ft. Wayne Elect Oo. T. Sec. Series A. fGeneral Electric Co. [old] ... com. General Electric Oo. [new]...... T.-H. Elec. Oo. T. Secur., Series D. Westinghouse Elec. & Mfg. Co. com. Westinghouse El. & Mfg. Co. pfd. Westinghouse El. & Mfg. Oo. assent. 809 125 48 25 -100 40,000,000 80,460,000 2 % Q., Aug., 1898. 100 18,276,000 18,276,000 1% % Q., Jan., 1900 187 1873 240 4,000,000 146,700 8,996,058 8,195,126 ..... **Q., Jan.,** 50 50 4,000,000 50 11,000,000 Rochester, N. Y .- Apr 30 18 Rochester Railway Co..... 100 5,000,000 5,000,000 New York.-Apr 30. 7,988,000 2,000,000 1½ % Oct., '98. 9,188,000 4,000,000 Reading, Pa.-Apr 30 100 100 100 119 120 1.000.000 1.000.000 Semi-an..Jan. & Jy 12 8 82 50 850,000 850,000 Jan., '98. 1,000,000 11,000,000 Jan., '98. 100 40,000,000 80,460,000 2 % Q., Aug., 1898. 100 18,276,000 18,276,000 1% % Q., Jan., 1900. 100 1,000,000 1,000,000 1. 50 187 1871/2 St. Louis Mo.-Apr 30. 150,000 400,000 2 % Dec., 1888. 2,400,000 1½ % Jan., '99. 2,479,000 1½ % Jan. '99. 2,500,000 1,500,000 4 %, Oct., '98. 2,000,000 2½ %, Jan., '99. 2,300,000 1½ % Jan., '99. 800,000 50c., Dec., '89. 500,000 1,000,000 8 %, Jan., '99. 2,500,000 4,000,000 8 % A., July, '19 41 110 150,000 800,000 400,000 2,500,000 2,500,000 2,500,000 2,000,000 2,000,000 1,000,000 1,000,000 2,500,000 1,000,000 2,500,000 4,000,000 21 73½ 136 233 50 100 Pittsburg, Pa.-Apr 30 Allegheny County Light Co..... East End Electric Light Co..... 172 Philadelphia, Pa.-Apr 30 2,000,000 8,500,000 5,000,000 550,000 80 92 18 801/4 921/4 18/4 .... San Francisco, Cal.-Apr. 47 20 10 160 1,000,000 1,000,000 18,750,000 18 500,000 48 91 14 119 California St. Cable RR... Geary Street Park & Ocean RR... Market Street Ry... Fresidio & Ferries RR... 100 100 61<sup>1</sup> 850,000 16 1,000,000 175,000 100,000 1,200,000 196 98 118 10 ••••• Scranton Pa -Apr 30 100 2 % Q., Oct., 29 165 m Scranton & Carbondale Trac. Co... m Scranton & Pittston Traction Co... 50 100 100 6.000,000 2,500,000 500,000 1,085,000 134 % Q 8 % 8, Dec. 1, 98, 1,000,000 2013 200 181 1,050,000 1,050,000 Springfield III.—Apr 30: Springfield Consolidated By .. 100 105 /ic was red ‡ Ex `ent 100 750,000 750,000 †On Aug. 17 last by a majority vote of the stockholders the capital stock was to \$20,827,200, of which \$18,276,000 is common and \$2,551,200 preferred. [Recently acquired the Edison Illuminating Co. of Brooklyn and its constitution, the Municipal Electric Light Co. Springfield O.-Apr 30 Springfield Street Ry..... 11 1,000,000 1,000,000 Springfield, Mass.-Apr 30. ALLIED INDUSTRIES. pringfield Street Ry..... 207 212 100 1,200,000 1,166,700 8 % A. Toronto Canada.-Apr 30. Roston Mass.-Apr 30: 6,000,000 134 % 8. 4,000,000 4 % 8. 2 96 ⅓ 255 973 BOSLOR MESS.—All Oc. Delaware Gas Light Co.......com. Delaware Gas Light Co......pref. American Electric Heating Co...... Street Ry. & Illu'g Properties...pfd United Electric Securities Co...pfd. 100 6 000 000 Toronto Street Ry...... Montreal Street Bailway Co...... 500,000 72× J. & J. J. & J. 50 10,000,000 100 4,500,000 Washington, D. C.-Apr 30: 1,248,700 \$2 p. sh. Jan. 26, '96 1,000,000 \$8.50 p.sh. Nov' 19 50 500,000 500,000 550,000 550,000 550,000 650,000 650,000 650 707,000 652,000 50 200,000 200,000 500 200,000 500 200,000 500 200,000 500 200,000 500 200,000 500,000 100 100 100 101 New York.-Apr 80: 85 15 40 16 Consolidated Electric Storage Co... Safety Car Heating & Lighting Co... Worthington Pump Co.....com. Worthington Pump Co.....pfd 8 150 12 155 .... 458,900 2½ % Q. 1.000,000 5,500,000 2,000,000 5,500,000 2,000,000 100 XX ιīο Worcester, Mass.-Apr 30 8,000,000 2,000,000 8 % S., Feb., '98. 542,500 4% %, 1897. \*Worcester Traction Co...... com. Worcester Traction Co...... % pfd. Worcester & Suburban Street Ry... 8,000,000 2,000,000 550,000 82 106 85 Philadelphia Pa.-Apr 30 1.4% 100 100 Electro Pneumatic Trans. Co..... United Gas Improvement Co..scrip. Welsbach Commercial Co....com. Welsbach Commercial Co....pfd. Welsbach Light Co... Welsbach Light Co., Canada..... 10 50 100 100 1,500,000 10,000,000 8,500,000 500,000 23 16 65 Wilkesbarre, Pa.-Apr 30. 2 X Q Wilkesbarre & Wyoming Val. Trac... 100 5,000,000 5,000,000 1%, Jan. \*Unlisted. † Paid in. ‡ Full paid. † Outstanding. † Ex-div. a Leased to Hestonville, Man & Fairmount Passenger Ry, for 6 % on stock per annum. b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company. c Practically all shares owned by Union Traction Company. d Lease to Frank ford & Southwark Passenger Ry, assumed by Electric Traction Co. c Leased to Electric Traction Company. f Controlled by Frank ford & Southwark Passenger Railway. g Leased to People's Passenger Railway at \$5 per share. h Majority of stock owned by People's Traction Company. Leased to United Traction Company. j Lease transferred to Union Traction Company. j Leased to United Traction Company at a reutal of \$10,000 per annum in 1866-7-8 p.a. \$20,000 in 1809-1900 and \$30,00 per annum thereafter, payable semi-annually, rental. declared as a dividend semi-annually. k Dividend of 10 % guaranteed by Reading Traction Company. Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co. 43½ 43½ 1½ 134 Pittsburg, Pa.—Apr 30: Carborundum Mfg. Co...... Standard Underground Cable Co... 200,000 1,000,000 ë 175 100 1,000,000 180 Miscellaneous.-Apr 30: 143 104 82 85 105 2 40 17 1,000,000 2,500,000 îŝ 100 25 100 1,250,000 58 109 1,250,000 ⅓% Feb 100 100 100 50 80 2 % Sept 1,'99. 100

"Unlisted.



# BONDS.

PASSEN	PASSENGER RAILWAY.					PASSENGER RAILWAY.							
RANG.	Authorised.		D29	Interest periods.	Bid.	Asked.	RAND.	Amo Anthorised.	Israed.	Pws	Interest persona.	Biá.	AcheA
Albany N. Y.  Date of Quotation—Apr 30, 1900  The Albany Ry. CoCons. mig. 5s. The Albany Ry. CoGen. mig. 5s. Twastervicit Turnpike & RR.1st mig. 6s Watervicit Turnpike & RB2d mig. 6s. Troy Oity Railway Co	\$500,000 \$50,000 \$50,000 150,000	875,000 850,000	1947 1919	J. & J. M. & N. M. & N. M. & N.	*117 *125	1271/4	New OPleans La.  Dete of Quotation—Apr 30, 1900.  Canal & Jialborne RR cons mig. 6s. Crescent City RR	5,000,000 416,500 5,000,000 850,000 800,000	8,000,000 899,000 2,599,500 850,000 800,000	1899 1948 1908 1948 1907 1912	M. & N. J. & J. J. & D. J. & J. F. & A.	105) <sub>4</sub> 108, 112	112 118
Baltimore Md.  Date of Quotation—Apr 30, 1500  United Electric By, Colst mtg. g. 4s.  **** "	14,000,000 2,000,000 1,500,000 1,250,000 1,750,000 750,000 800,000 96,000 604,000 8,000,000	1,250,000 1,750,000 117,000	1949 1911 1929 1901 1942 1900 1906 1912 1932	J. & D. M. & N. M. & N. M. & S. J. & D. J. & J. N. & M. J. & J. M. & N. J. & D.	102 74 <sup>4</sup> / <sub>4</sub> 118 <sup>7</sup> / <sub>8</sub> 119 104 <sup>1</sup> / <sub>8</sub> 121 101 102 <sup>1</sup> / <sub>9</sub>  119 116 117	102½ 75 120  121½  121 117	Date of Quotation—Apr 30, 1900. Atlantic Ave. (Brooklyn) Imp. g. 5s. Atlantic Av. (Brooklyn) Sigen. mig. 5s. tAtlantic Av. (Brooklyn) Cons. mig. 5s. tAtlantic Av. (Brooklyn) Cons. mig. 5s. tBroidway & 7th Ave tell mig. 5s. Broadway & 7th Ave let mig. 5s. Broadway & 7th Ave let mig. 5s. Broadway Surface let mig. 5s. Broadway Surface let mig. 5s. Brooklyn City & Newtown let mig. 5s. Brooklyn City & Newtown let. mig. 5s. Brooklyn, Bath & W. E. RR. Gen. mig. 5s. Brooklyn, Bath & W. E. RR. Gen. mig. 5s. Brooklyn, G's Co. & Sub'n let mig. 5s. Brooklyn, Q's Co. & Sub'n let mig. 5s. Brooklyn, Rapid Transit gold 5s. Bleecker 5s. & Full'in Fer'y RR. let mig. 5s. Bleecker 5s. & Full'in Fer'y RR. let mig. 5s.	779,000 8,000,000 1,500,000 1,500,000 1,125,000 1,000,000 6,000,000 2,000,000 2,000,000 2,500,000 4,500,000 7,000,000	1,966,000 7,650,000 1,500,000 500,000 1,125,000 1,000,000 6,000,000 2,000,000 448,000	1909 1981 1943 1904 1914 1924 1905 1941 1933 1941 1941 1945 1900	M. & S. A. & O. J. & D. J. & D. J. & J. J. & J. J. & J. J. & J. J. & J. M. & N.	95 107 % 115 128 104 108 115 105 116 116 116 117 107 107 101 %	110 116 125 105 % 110 117 116 117 116
sumed by the United Railways & Electric Company.  BOSTON, MASS.  Date of Quotation—Apr 30, 1900.  *Lynn & Boston RR	5,879,000 8,000,000 2,000,000 500,000	2,000,000	1902	J. & D. M. & N. M. & S. J. & J. J. & J.	114 1043/4 112	115 106	Cent P'k, N. & E. R. RR. 1st cons. mig. 4s Central Crosstown RR	250,000 1,000,000 1,000,000 1,000,000 1,500,000 1,500,000 12,500,000 12,500,000 1,500,000 350,000 5,000,000 1,500,000 1,500,000 1,500,000 2,000,000	250,000 800,000 1,100,000 1,100,000 1,200,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 2,000,000	1922 1908 1932 1914 1914 1915 1908 1909 1909 1922 1919 1987 1909 1906 1942	M. & N. J. & J. J. & J. J. & D. F. & A. F. & A. M. & S. J. & J. M. & S. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J.	125 101 117 102 108 1165 89 124 120 120 1785 116 1105 1105 1105 118	109
Chicago III.  Date of Quotation—Apr 30, 1500.  Ohicago City Ry	400,000 1,000,000 7,500,000 1,500,000 1,500,000 15,000,000 8,171,000 500,000 500,000 4,100,000 2,500,000 4,100,000 2,700,000 12,500,000	500,000 7,500,000 4,040,000 8,781,200 15,000,000 8,171,000 500,000 2,500,000 8,969,000	1908 1929 1929 1907 1982 1942 1906 1911 1900 1927 1928 1911 1986	F. & A. J. & D. A. & O. J. & J. J. & J. J. & J. J. & J. J. & J. M. & N. J. & D.	1015/4  108/4  96 106  101 1065/6	23/4 102  109  96/4  111 102 107	11Westchester Electric RR1st mig. 5s. 181,085,000 in escrow to retire gen. mig. bonds. 184,850,000 in escrow to retire maturing obligations. 18552,000 in escrow to retire 1st and 2d mig. bonds. 2In treasury. \$30,000. 11 Guar. by Union By. Co. TOPONTO CANAGA. Date of Quotation—Apr 30, 1900. Montreal St. By	2,500,000 4,550,000			Mr. & S.		Dong Dong
†Bedeemable at option on 60 da. notice.  †Funded debt assumed by Ohicago W. Div. By. Co., controlling interest of which is owned by W. Ohicago St. RR. Co., lessee.  †Bubject to call after Oct. 1, 1899, at ¶110 and interest.    Assumed by W. Ohi. RR. Co., lessee.   Int. guar. by W. Ohicago St. RR. Co.    Cincinnati, O.   Busic of Quotation—Apr30, 1 900.  Oin. New. & Cov.St. Ry. ist Con.mig. g. 5e.  †Mt. Adams & Eden P'k In 1st mig. 6e. †Mt. Adams & Eden P'k In 1st mig. 6e. †Mt. Adams & Eden P'k In 1st mig. 6e. †Mt. Adams & Eden P'k In 1st mig. 6e. †Mt. Adams & Eden P'k In 1st mig. 6e. †Mt. Adams & Eden P'k In 1st mig. 6e. †Mt. Adams & Eden P'k In 1st mig. 6e. †Mt. Adams & Eden P'k In 1st mig. 6e. †Mt. Adams & Eden P'k In 1st mig. 6e. †Mt. Odams & Eden P'k In 1st mig. 6e. †Mt.	8,000,000 46,000 100,000	100,000 581,000 250,000	1900 1905 1906 1912	J. & J. A. & O. M. & S. M. & S. J. & J.	118 ½ 108 ½ 114 108 ½ 12: ½ 182 ½	1141/4 104  1221/4 187	Continental Pass. By	800,000 100,000 250,000 250,000 1,125,000 5,994,210 200,000 1,800,000 500,000 29,785,000 750,000	100,000 250,000 458,000 867,000 200,000 1,018,000 100,000 500,000 29,724,876	1898 1901 1905 1911 1912 1943 1910 1903 1911 1945 1906	J.&J. J.&J. M.&S. J.&. F.&. A.&O. A.&O.		0-000 0-000 1-000
Cleveland, O.  Date of Quotation - Apr 30, 1900.  aBrooklyn Street RR. Coist mtg. 5s. Clin. New't & Cov. St. RyCons. mtg. 5s. Cleveland City Cable Ryist mtg. 5s. Columbus (O.) Cent. Byist mtg. g. 5s. Columbus (O.) Cent. Byist mtg. g. 5s. Elset Cleveland RRist mtg. g. 5s. Ft. Wayne (Ind.) Elec. By. 1st mtg. g. 6s. Lorain (O.) Street Ryist mtg. 5s. 18t. Ry. Co., Grand Rapidslat mtg. 5s. 18t., 900,000 in escrow to retire bonds of absorbed companies, marked a. 1Interest guar. by Cons. St. Ry. Co.  DetPoit, Mich.	2,000,000 8,500,000	2,500,000 2,000,000 1,249,000 1,500,000 1,000,000	1922 1909 1918 1918 1910 1922 1915	J. & J. M. & S. M. & N.	106 1/4 118 1/4 105 1/4 106	107 114% 106 107 	Pittsburg. Pa.  Date of Quotation—Apr 30 1900  Birmingham, Knox & Allentown	875.000 1,250,000 1,500,000 50,000 1,250,000 750,000 250,000 750,000 1,500,000	1,250,000 1,500,000 50,000 1,250,000 750,000 750,000 1,500,000 500,000 1,400,000 2,000,000	1950 1927 1930 1918 1942 1928 1924 1927 1929 1929 1930 1934	J. &. J A. & O. J. & J. J. & J. M. & N. J. & J. A. & O. M. & N.	1111/4	118
Date of Quotation—Apr 30 1600.  †Detroit Citisens' St. Ry	400,000	8,885,000 877,000 1,800,000	1902	A. & O.	105	102½ 106½	Providence R. I.  Date of Quotation—Apr 30, 1100.  Newport Street Ry	50,000 9,000,000	50,000 8,260,000	1910 1953	J. & D. M. & S.	ŧiĞ	118
Bate of Quotation—Apr 30, 1100  New Haven St. Ry	600,000 250,000 100,000 100,000	600,000 250,000 800,000 24,000	1914 1912	J&D M&N	111 111 109 	:::::	Date of Quotation—Apr 30, 1500, Baden & St. Louis RR1st mtg. 5s, Cass Ave. & Fair Gds Ry1st mtg. 5s, Citizens' Railway Co1st mtg. 5s, Comp. Hts. Un. De. & Mer. Ter1st	5000,0 <b>9</b> 0 1,500,000 <b>2,00</b> 0,000 <b>1 000 000</b>	250,000 1,600,000 1,600,000 000 000	1912 1907	]#] ]#]	100 -3 109 117 With in	102 102½ 109½ 118

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PASSENGER RAILWAY.										
NAME.	Amo Authorized.		Due	Interest periods.	Bid.	Asked.				
St. Louis.										
Date of Quotation—Apr 30, 1900,  Jefferson Avenue Bylst mtg. 5s.	400,000			M. & N.	108	105				
Lindell Ry. Colst mtg. 5s Missouri RB, Co	1,500,000	700,000	1916	F. & A. M. & B.	108	109 106 102				
tMound City RB. Colst mtg. 6s. People's RR. Colst mtg. 6s. People's RR. Colst mtg. 7s.	400,000 125,000 75,000	800,000 125,000 75.000	1902 1902	A. & O. J. & D. M. & N.	100					
People's RR. Co	1,000,000 75,000	800,000 75,000	1904 1905	J. & J.	100	101				
St. Louis & Sub. Ry1st mig. 5s.	2,000,000 2,000,000	2,000,000 1,400,000	1900 1921	M. & N.	99 1/6 108	100 ⅓ 104				
St. Louis & Sub. Ry	800,000 500,000		1909	M. & N.	80 106	108				
Taylor Avenue St. Ry1st mtg. g. 6s. Union Depot RR. Co1st cons. mtg. 6s.	500,000 1,091,000 8,500,000		1918 1900 1918	A. & O.	116 100 121	118 100% 122				
Union Depot RR. CoCons. mtg. 6s.	0,500,000	1,101,000	1510	J. CS J.	121	144				
Controlled by Union Depot RR. Co. Controlled by Lindell RR. Co. \$200,000 in escrow to retire 1st & 2d		1								
mtg. \$8000,000 in escrow. †18200,000 in escrow to retire 1st mtg.										
bde				٠.						
San Francisco Cal. Date of Quotation—Apr., 1900.	]				ļ					
California St. Cable BRlst mtg. g. 5s.	650,000	650,000	1914		114	117 117				
Market St. Oable Ry. Colst mtg. g. 6s.	1,000,000 8,000,000	8,000,000	1921 1918		1263	95 				
†Metropolitan Ry. Co	200,000 2,000,000 850,000	2,000,000 850,000	1918	A. & O. J. & J.	126 % 105 %	107				
Park & Cliff House BBlst mtg. 6s. Park & Ocean BBlst mtg. 6s. Powell St. Bylst mtg. 6s.	250,000 700,000	250.000 700,000	1914 1912	J. & J. M. & S.	115	125				
Sutter St. Ry. Co	1,000,000	900,000	1918	M. & N.	••••	•••••				
Washington D. C. Date of Quotation—Apr 30, 1900										
Belt Ry. Co	500,000 500,000	450,000 500,000	19 <b>20</b> 1914	J. & J. A. & O.	182	••••				
Eckington & Soldiers' Home, or mtg. 6s. Metropolitan BR. CoColl. tr. cons. 6s.	200,000 500,000	200,000	1911 1 <b>90</b> 1	J. & D.		•••••				
†\$50,000 in escrow to retire 1st mtg.bds. Miscellaneous.										
Date of Quotation-Apr 30, 1900.	0.000	1 400	1000							
Bridgeport Traction Colst mtg. 5s. Buffalo (N. Y.) By. CoCons. mtg. 5s. †('tizens' St. R. (Ind'polts).lst cons.m.5s	5,000,000 5,000,000	1,688,000 8,548,000	1931	J. & J. F. & A.	108 118	110				
Columbus (O.) St. Ry1st cons. g. 5s.	8,000,000	8,000,000 2,866,000 2,261,000	1932	M. & N. M. & N. J. & J.	104 112 115	103 118				
Consolidated Traction (N. J.)181 mig.58	15,000,000 2,000,000	18,965,000 572,000	1933	J. & D. J. & D.	111½ 115	111% 115%				
Denver Con. Tram'y CoCon. m. g. 5s.	4,000,000	8,800,000 922,000	1933	J. & J. A. & O.	20 80	85				
Louisville (Ky.) Rylst cons. mtg. g.5s. Minneapolis St. Rylst cons. mtg. g. 5s †No. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	6,000,000 5,000,000 8,000,000	4,981,000 4,050,000 2,378,000	1919	J. & J. J. & J.	119 1101/4	110%				
No. Hudson Co. Ry. (N. J.)Deb. 6s.	550,000	550,000 489,000	1928	J. & J. M. & N. F. & A.	108	•••••				
Rochester (N. Y.) Bylst mtg. 5s.	1,250,000 8,000,000	1,000,000 2,000,000	1931	J. & D. A. & O.						
St. Paul City RyOons. g. 5s. St. Paul City RyDeb. g. 6s.	5,500,000 1,000,000	4,298,000 1,000,000			1051/ <sub>4</sub> 103	106				
†\$1,000,000 in escrow to retire 1st and d mig. bds.										
1\$800,000 in treasury. Bonds guar, by										
98760,000 in escrow to retire bonds of O. St. RR. Co.	i i									
1837,000 in treasury. 18360,000 res'ved to redeem prior liens. 148620,000 in escrow.										
ELEOTRIO LIGHT AN	D ELE	CTRIC	A		*With	OS,				
Boston, Mass.	 [	<u> </u>								
Date of Quotation—Apr 30, 1900.  Delaware Gas Lt. Co.,1st m. 5s, g.	800,000	800,000		J. & J.	106	•••••				
Edison Elec. Illuminating Oo., Boston General Electric Oo., gold coup, deb. 5s	2,026,000 10,000,000	8,750,000	1922	Quar.	157 116	••••				
Pittsburg Pa Date of Quotation—Apr 30, 1900										
Allegheny County Light Co	500,000 195,570		1911	J. & J. M. & S.	110	•••••				
Miscellaneous(Apr 30, 1900.)										
E lison El. Ilig. Co. (N. York) 1st m. 5s E lison El. Ilig. Co. (N. Y.) con. m. g. 5s.	4,812,000 15,000,000 5,000,000	4,812,000 2,188,000 5,000,000	1910 1993 1940		109 124 1221⁄4	124				
E lison Elec. Illg. Oo. (Brooklyn) E lison Electric Light (Philadelphia) Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,000,000 2,500,000	2,500,00	1937	A. & O.	100	103				
Kings Co. El. Lt. & Pow. Co.lst mtg. 5s. Kings Co. El. Lt. & Po. Co.pur. money 6s Milwaukee El. Ry & Lt. Co.lst con. g. 5s.	5,176,000 8,000,00 <b>0</b>	5,176,00 <sup>0</sup> 6,103,00 <sup>0</sup>	1997	A & O. F. & A.	120 1025 <sub>9</sub>	122				
Milwaukee El. Ry & Lt. Co.lst con. g. 5s. United Elec. Light & Power Co(N. Y.) TELEPHONE	5,000,000 <b>AND</b>		] ⊇ <i>R</i>	APH	<b> </b>	•				
Miscellaneous.	I	IELEG		<u> </u>						
Date of Quotation—Apr 30, 1900, American Bell Telephone			1908	F. & A.	1001/2	101				
Northwestern Telegraph Co78. N.Y. & N.J. Telep & Telg Co. gen.mtg.58	*******				114	115				
Chesapeake & Potomac Teleph. Co5s.		_	1911	J. & D.	108	106				
ALLIED	INDU	STRIE	s.	1						
Miscellaneous.  Date of Quotation—Apr 30, 1900										
American Electric Heating78 Armington & Sims Engine Co		500,000			••••	25				
Barney & Smith Car Co		•••••	1942 1904	J&D.	106	107				
Worthington Pump Co	75,000 al.		1	.1	115	1 120				

## NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 163@17c.; Lake, 17@17&2.; casting, 164(417c.

The Massachusetts Electric Company has declared a dividend of 2 per cent. on its preferred stock, payable June 1 to stock of record May 15

The Columbus & Lancaster Traction Company, of Columbus, O., has decided to

increase its capital stock from \$500,000 to \$1,000,000.

The National Carbon Company has declared a dividend of 13 per cent. on its preferred stock, payable May 15. Books close May 5 and reopen May 16.

The United States Automatic Telephone Company of New York certifies that it has paid in one half of its capital stock, which amounts to \$1,000,000.

The Poonle's Gas & Electric Company of Oswego, N. Y., capital \$450,000, and Niagara Falls Milling Company, capital \$200,000, have been incorporated.

Governer Roosevelt has vetoed the Sullivan bill, which allowed electric light

The American District Telegraph Company has declared a dividend of 1 per cent., payable May 15. George B. Wilson has been added to the executive committee.

It is officially announced that the plan for the consolidation of the Welsbach Light Company and the Welsbach Commercial Company will be made public in a tew days.

The Westinghouse Electric & Manufacturing Company has declared a quarterly dividend of 1½ per cent. on its assenting stock, payable May 15. Books closed May 1 and reopen May 16.

It is understood that a proposition looking to an increase in the capital stock from \$18,000,000 to \$20,000,000 will shortly be submitted to stockholders of the Columbus (O.) Street Railway Company.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 22(226; New York Electric Vehicle Transportation, 11(2); New England Transportation, 4½(25); Gramophone, 42(45).

The new management of the Taird Avenue Railroad of New York, which is now under Metropolitan Street Railway control, has reduced the wages of the motormen fully 10 per cent. and effected a saving estimated at \$70,000 a year.

The United Gas Improvement Confoany of Philadelphia has purchased a controlling interest in the Hudson River Gas and Electric Company. The purchase is made out of the proceeds of the sale of the \$7,500,000 new stock of the United Gas Improvement Company.

The market for copper during the past week has been very quiet with very little business doing, and what little business going on has been done on old contracts. The export business has been good and amounts for April to 11,276 tons, as per Metal Exchange returns.

The report of the New York Electric Vehicle Transportation Company for the fiscal year ended December 31, 1899, shows the following: Gross earnings, \$156,568; operating expenses, \$145,189; net earnings, \$11,279; other income, \$28,293; total net income \$39,670; patents, etc., \$4,768; balance, \$34,931.

A dispatch from Ch cago states that the Metropolitan West Side Elevated Railway Company's traffic for one twenty-two days of April, which includes four Sundays, approximately increased 19 per cent. over the same period of last year. The management believes that the net earnings will show a gain of about 19 per cent. for the month.

At the annual meeting of the Electric Company of America, held at Camden, N. J., the following directors were re-elected: A. Louden Snowden, William L. Elkins, P. A. B. Widener, Martin Maloney, Thomas Dolan, William J. Latta, Charles A. Porter, Joseph B. McCaull and James E. Hayes. The company's assets are \$3,900,405.35. Dividends amounting to \$202,419 were paid.

The annual statement of the United Railways and Electric Company of Baltimore, submitted at a meeting of the executive committee, made the following showing: Gross earnings, April 1, 1899, to March 31, 1990, \$4 3)4,932 68; operating expenses, taxes, etc., \$3,734,896 35; surplus, \$570,046 31; interest on income bonds and preferred stock, \$560,000; surplus, \$10,046; surplus United Electric Power, eleven months, \$82,013.80; total surplus, \$92,059.

With an authorized capital stock of \$8,000,000, of which \$2,500,000 already is subwith an authorized capital stock of \$5,000,000, of which \$2,500,000 already is subscribed for, the Cuba Company was incorporated in Trenton, N. J. The stock is divided into shares of \$50,000 εach. The incorporators are W. C. Van Horne, Levi P. Morton, W. C. Whitney and Thomas Ryan, holding eight shares each; C. G. Hanen, six shares; E. A. Harriman and James J. Hill, four shares each; William L. Bull, three shares, and H. L. Terry, one share. The company is to operate steam railroads and electric lines in Cuba.

President John E. Hudson of the American Bell Telephone Company notifies stockholders by circular that in pursuance of the vote passed at the amnual meeting on March 27 that there be distributed to stockholders two shares of the stock of the American Telephone and Telephone at Telephone stock, the treasurer will on May 15 begin to make the exchange of stock. Receipts will be furnished stockholders upon deposit of their certificates with the treasurer. The company will affix all revenue stamps.

It is announced that James R. Krene has left Wall Street forever, that before sailing for Europe on Saturday to recuperate his health he closed up all of his deals and departed with a fortune estimated all the way from \$12,000,000 to \$20,000,000, which is offset by ill health and shattered nerves. The absence of this great operator from Wall Street, even though for a short period, must have an effect upon the market. His work has generally been upon the short side of the market, the drive against Brooklyn Rapid Transit being one of the mest conspicuous, as well as one of his most successful moves. of his most successful moves.

The New York State Board of Tax Commissioners made public on April 39 the final valuations on the franchises of the street railway companies and lighting corporations operating in Greater New York. The final values are: Metropolitan Street Railway Company, \$52,292,317; Manhattan Elevated Railway Company, \$46,127,000; Brooklyn Rapid Transit Company, \$28,867,669: Third Avenue Railroad Company, \$16,93,101; Edison Electric Company, New York, \$8,091,328; Edison Electric Company, Brooklyn, \$2,423,891. The final valuation of all the franchises owned by the companies mentioned is \$29,596,446 less than the value fixed by the Commissioners early in April.

The Philadalphis "Stockholder" saws: "Procklyn Parid Transit steels have

Commissioners early in April.

The Philadelphia "Stockholder" says: "Brooklyn Rapid Transit stock has many friends in the Street who claim that its prospects are very bright, and that on these alone it should seek a higher price level. No doubt is expressed that the system is a great earner. Certainly it must be, traversing, as it does, a wide, growing and thickly populated territory. Of the total capital stock of \$45,000,000 there is outstanding \$13,000,000. Par value of shares is \$100 each. To pay a dividend at the rate of 2 per cent, on the stock issued would require \$860,000. It is understood that business of the company is rapidly increasing, and those close to the management predict that if even the present rate of gain is maintained throughout the present year a dividend of not less than 2 per cent, will be shown earned on the stock. As a result of operations for 1898 there was shown a surplus, after all interest and fixed charges, etc., of \$413,853. Since that year the company is understood to have made material progress in the right direction, and it would not be surprising, therefore, to see the stock placed on a dividend-paying basis before a great while."



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# **FLECTRICITY**

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### EDITORIAL NOTES.

The Thermopile.

As is well known there are a number of ways of producing an electric current, as for instance,

by means of a prime mover attached to an electric generator, such as a steam engine, gas engine or turbine, by means of a primary battery, in which an acid solution acts on carbon or metal plates by friction, as in the case of the static machine, and lastly, by heat. The three first methods are in common use, and while inventors have long been at work endeavoring to devise a means for converting heat into electricity direct, no really satisfactory results have been obtained.

This is all the more to be regretted in view of the fact that such an invention if made to work satisfactorily would prove of great value, and would undoubtedly be the means of effecting a financial saving in the generation of electrical power. Any step tending to the solution of this problem is of interest, and it is therefore worthy of note that letters patent were issued on May 1 to a resident of Pueblo, Col., for a thermo-electric generator, which, according to the description, differs somewhat from any heretofore brought out. What the inventor claims is: "In a thermal electric generator, a body having a heated area consisting of a series of electrically-connected vessels containing stored heat and a heat-generator, flexible conductors of electricity connected with separate parts of said body, and a shell composed of different metals having a cold area, and a diaphragm extending from one inner side portion to the other over the said cold area, and in direct electrical connection with said conductors."

Probably the most successful thermopile yet devised consists of a series of castings, composed of alloy of antimony and zinc, connected by thin strips of copper. The casting has to be done at a high temperature and under pressure to insure homogeneity of product as well as to make a complete junction between the copper strip and the alloy. The couples are subjected to an annealing process by which the alloy, which would otherwise be exceedingly brittle, is hardened and toughened. In the pile referred to, a number of elements are formed into a ring and a number of these rings superposed form a hollow cylinder, the interior and exterior of which are covered with cement, and

the whole enclosed in a sheet-iron water-jacket cover ready for use. A Bunsen flame, which occupies the axis of the cylinder, is deflected against the interior cylindrical surface by a series of reflectors.

With such a thermo electric generator it was possible to operate a small fan motor, an electric bell or a medical coil, with a consumption of gas of about 21 cubic feet an hour. The principal drawbacks to a thermopile of this description lie, first, in its great internal resistance, and, secondly, in the fact that the alloy in becoming alternately hot and cold is apt in time to oxidize and cause the pile to fail. Furthermore, it is almost impossible to manufacture two generators that will have the same output, and until these defects are overcome the thermopile can hardly be called a commercial success, although we understand there are a number in use for various purposes in New York City.

As already stated, however, in view of the great advantages to be derived by direct conversion of heat into electricity, any progress made along this line will be watched with interest, not only by the electrical fraternity but by the whole scientific world.

\* \* \*

Trees Being Electrocuted.

The single conductor overhead trolley system has apparently much to answer for. It is held re-

sponsible for damage to underground pipes amounting to thousands of dollars, and now another grave sin has been registered against it. We refer to what might be termed the electrocuting of trees, regarding which a prominent resident of Bay Ridge, Brooklyn, has this to say:

"Five years ago there was the finest natural archway of trees, between Sixty-fifth street and Fort Hamilton, to be found within the limits of Greater New York. Now, for blocks at a stretch, one tree, at least, out of every three, is blasted, and the others, though they are in leaf in the summer, are losing their vitality, and are surely doomed unless the destroying influence can be averted in some

"I am confident that if the public knew at the time the wires were strung through the trees the effect the leaking electricity would have, there would have been such a kick that the wires would, at least, have been more carefully strung. The public understood that the wires were covered with insulating material, and that even, as in nearly every case, when they touched or rested on branches the trees would be safe.

"I have talked with electrical experts since then and have been told that there is no such thing as an insulating material through which electricity will not slowly make its way. It is only a matter of time before it will leak through any material in such a way as to destroy anything the wires may happen to be in contact with. I think something should be done to save the rest of the trees. Their destruction is an act of vandalism."

The residents of that locality claim that in damp weather electric current leaks through the insulation of the trolley feeder cables where they come in contact with branches of the trees and passing through the latter seeks the ground. In support of this theory it is asserted that not long ago a tree fell, when an examination of its trunk revealed the fact that it was decayed and hollow through a greater part of its length. It is also stated that wherever a cable touches a branch it speedily shows signs of decay and eventually dies. There are any number of trees in this condition in that vicinity, that before the trolley was bullt put forth abundant foliage.

That escaping electric current is responsible for this condition of affairs is very likely, for the best of insulations will occasionally break down after being long in use, and there is no doubt but what a wet tree offers an excellent grounding medium. It is rather difficult, however, to explain why an electric current at a comparatively low voltage should cause a tree to decay and rot, especially when it was reported from Brussels, Belgium, some time ago that stray trolley currents were "stimulating" the trees along a certain avenue in that city and causing them to put forth an unusual number of blossoms.

However, the condition of affairs in Bay Ridge would seem serious enough to warrant a careful examination being made, after which if the trolley companies are found at fault steps should be taken to compel them to more thoroughly insulate their conductors, or better still, to so run their cables that the leakage of current to a tree would be impossible. Such action would serve as a precedent and might in future prevent a similar condition of affairs elsewhere. In fact it is the least that is due to the residents of that vicinity, who naturally take a proper pride in their surroundings.

Signal Corps Work in the Philippines.

General A. W. Greely, chief of the U. S. Signal Corps, was reported as saying that

\*

in the evolution of signaling the flag had largely given away for day work to the heliograph, and he might aptly have added that for field work the wig-wag method has been almost wholly superseded by the telegraph and telephone. In other words, members of a signal corps at the present day should be familiar with electrical apparatus, and be not only electricians, but expert telegraphers as well. When the war with Spain first broke out there was a dearth of electrical workers in the signal service, with the result that the transmission of messages during the early part of the conflict was considerably hampered. This condition of affairs was speedily remedied however, and at the present time the work of the United States Signal Corps in the Philippines is everything that could

be desired, and its efficiency is not only recognized in this country, but in Europe as well. Referring to the recent application of electricity to military purposes the British Superintendent of Telegraphs says: "It is our men's ambition to do as good work as the American telegraphers did for their country in Cuba and Porto Rico. . . . They have given us our ideal, and we will try and work up to it." Without disparaging the work of the Signal Corps in Cuba and Porto Rico, it is safe to assert that the work done by the men in the Philippines under Col. Allen, is equally as efficient if not more so. A Manila dispatch to the N. Y. "Sun," referring to this subject, states:

"Previous to General Lawton's campaign up the Rio Grande last October, and the subsequent routing of the insurgent government at Tarlac by General MacArthur, there were barely 250 miles of telegraph lines in operation under the Americans. With remarkable speed the new lines were erected and telegraph offices established in the rear of the moving troops. Captain Russell was in charge of the Signal Corps detachment that accompanied General Lawton on his muddy tour through the Nueva Ecija country and along the mountains to head off Aguinaldo, and it was owing to some mighty tall hustling by him and his men that General Lawton was able to keep in touch with Manila. The supply of insulated wire ran out, and it was necessary to lay bare wire for miles through the swamps and mire over which the column had to pass. By the aid of the little instrument called the buzzer it was possible to send and receive faint messages over this wire."

What rapid strides have been made in the running of wires may be inferred when it is stated that at the present time there are over one thousand miles in operation on the Island of Luzon. This extensive system is looked after and kept in working order by two companies of one hundred men each. In the district south of Manila the men are distributed among sixty-five telegraph offices and in the district to the north they are taking care of many more.

In the extensive field operations of January last the daily average of messages for the month was 5,000. The field outfit of the corps is something of a novelty. The signal man carries a small box which affords communication either by telegraph or telephone through the buzzer, already referred to. By means of the latter device some wonderful feats are said to have been accomplished in the way of telegraphing over country where the uninsulated wire has lain in mud and water, and Signal Corps men in one instance were able to carry communication past a break where the ends of the wire rested on the ground a foot apart.

In addition to operating and erecting lines the Signal Corps force of Luzon is constantly called upon to mend breaks that have been caused by the natives. This has resulted in the signal men having been under fire in no less than sixty-one skirmishes or engagements with a consequent loss of dead and wounded as great in percentage as any other organization in the Philippines.

AFTER thoroughly testing the apparatus of the General Electric Company, the Westinghouse Manufacturing Company, and the Sprague Electric Company, the directors of the Boston Elevated Railway Company have decided to make use of the Sprague Electric Company's controllers, in conjunction with the Sprague multiple-unit system, on a large number of its cars.

## UNDER THE SEARCHLIGHT.

#### Notes and Comments on Various Topics.

THE 300 horse-power generator that was made by the Bullock Electric Company of Cincinnati, O., for the Vincennes Annex of the Paris Exposition, and that was lost at sea, will soon be replaced by a new generator that has just been completed and shipped to Paris.

One of the largest express packages ever shipped out of Washington, D. C. from any consignor other than the Government was forwarded by the United States Express Company last week. The package weighed 2,000 pounds and consisted of electrical machinery, manufactured by the Hill-Murray Company of that city, to be used at Cape Nome for separating gold from sand.

THE Zanesville Coal Company has had an electric motor placed in position at its mine at Crooksville, O. The machine was used last week for the first time and worked perfectly.

CHARLES MURPHY, known as "Mile-a-Minute," has equipped his bicycle with a decided novelty. It consists of an electric storage battery, which is attached to the upper frame tube of the wheel, the switch being fastened to the steering head and the wires covering the handlebars and connecting with a storage battery at the rear of the saddle post. By grasping the wires Murphy claims a sufficient shock is given his arms to penetrate his whole body and give him a sense of renewed activity when needed in a spurt. Murphy says he is using this device with good results.

The Eric Railroad on May 4 introduced telephones to supplant the present telegraph system in its block signal towers. A school of instruction has been conducted at Port Jervis for the past month for the purpose of instructing men in the new system. It is alleged that the reason for the railway company's new departure is to be independent of the telegraph operators, who are forming a telegraphers' organization. The system was first introduced on the Delaware Division of the Eric.

THE United States Government has appointed Mr. Carl Hering an official delegate to the Paris International Electrical Congress, which will be held in the French metropolis from August 18 to 25.

THE Park Board of Detroit Mich., has authorized the construction of a rather novel electrical fountain for one of its parks. The basin will be 40 feet in diameter and the fountain proper will comprise five cobblestone columns, from the apex of each of which will burst a stream of water, all to be lighted by hidden electric bulbs. The fountain will cost \$3,000, and will it is hoped be completed by July 4.

A PATENT was issued recently for a "motor-driven car for use in warfare," which, if it is ever built, will be a fearfully destructive engine of devastation. It is nothing more than a battleship on wheels, or an armored automobile full of guns and other terrifying weapons, and also adapted to be so charged with electricity that rash storming parties attempting to board it will instantly be electrocuted.



F. A. Ross, superintendent of the local street railway system of Sacramento, Cal., is trying a new portable electric headlight. The light, instead of being placed over the motorman's head is inserted in a slot on the front end of the car and below the motorman's face instead of above. At the end of a run the light is lifted from the slot, carried around and inserted in the slot at the other end. It is simplicity itself, and in case the electric bulb burns out it can be replaced in a few seconds. The reflector is composed of burnished aluminum and lights up the track for fully a block.

FIRE-ALARM boxes in the public schools of Chicago are strongly advocated by City Electrician Ellicott, who says that it may yet be a choice between spending \$15,000 for such boxes and having a number of children burned to death. He has told President Graham Harris of the Board of Education what he thinks on the matter, and Mr. Harris is of the opinion that the alarms are necessary.

The first shipment of electric automobiles to the Mexican Electric Vehicle Company was recently made from New York. The Mexican company is said to be a sub-company of the Electric Vehicle Company. They are to operate a system of public cabs and omnibuses in Mexico City under concession granted to Mr. Charles L. Seegar. Subsequent shipments will be larger, and similar concessions may be procured in other Spanish-American countries where the cities may permit the traffic of such vehicles.

THE mills along the Battenkill have begun to derive benefit from the electric road from Greenwich to Schuylerville, N. Y., in the transfer of freight. The Boston Manufacturing Company, the Bennington Falls Pulp Company and the Washington Pulp and Paper Company of Middle Falls, have discontinued the use of teams in hauling freight between their mills and the station of the Greenwich and Johnsonville Railroad Company. The freight is now transferred by the use of the new electrical locomotive which is attached to the freight The goods are thus delivered at the cars. mills in the original cars in which they are received.

Toledo, O., is to have an electric tower. Eight electric lights at a height of 234 feet from the ground will form the most prominent object in the night landscape when approaching the city. The waterworks board has determined to place lights on a framework raised 14 feet above the present waterworks tower. The tower is octagonal in shape and one light will be placed for each side. In addition to the light thrown over the park surrounding the waterworks station, where it has been badly needed, and the light distributed over the surrounding portion of Upper Broadway, it is believed that the electric topped tower will be something of an advertisement and improvement.

A PATENT has recently been granted in this country on an electrical divining rod. According to the Chicago "Record" the device consists of a bell, an ordinary battery, the wires from which are attached to two stakes, presum ably of metal. The idea is that when the stakes are driven into the ground if there is a body of ore present the circuit will be completed and a bell will ring. Springs of water and subterranean streams, it is claimed, can be located in the same way.

A NUMBER of naphtha launch owners of Oshkosk, Wis., are installing electric motive power instead of naphtha, and the coming boating season promises several of the modern style of boats.

HERR JOH. HARDEN publishes in the "Elektrotechnische Zeitschrift of April 5th an account of some experiments to ascertain the precise action that takes place when a coherer is under the influence of electric waves. He employed, according to the London "Electrician," a coherer consisting merely of two steel points, and observed it through a microscope. When at a distance of 0.3 mm., sparks passed between them while the neighboring oscillator was in operation; but no current flowed through the battery and galvanometer circuit, which evidently remained interrupted by the coherer. It was not until the points were approached to within 0.006 mm. of one another that a deflection (corresponding to 150 milliamperes) was obtained. With this distance between the points, as soon as the spark occurred, a dark bridge was seen to have formed across the gap. This could be clearly seen with a microscope magnifying 300 times and against a background of white paper. As soon as this bridge appeared the sparking ceased. The bridge remained and the deflection of the galvanometer continued practically constant, until the coherer was shaken.

That Africa is no longer the Dark Continent is proved by the news that an automobile service has been started between the Senegal and the Niger. The automobiles are said to be of Parisian make and are run by Frenchmen.

M. C. CLARK, who has interested himself in bringing off a race between motor vehicles during convention week in Kansas City, Mo., for the benefit of Convention Hall, has received a large number of letters from automobile and motor cycle manufacturers offering to have vehicles ready for the occasion. Mr. Clark's plan is to have a race, probably on the driving club's track, between all sorts of horseless vehicles

The General Carriage Company of this city recently purchased the old 6th avenue car stables, running from 43d to 44th street for a factory site. The site has a frontage of 200 feet on 6th avenue and extends toward 5th avenue 240 feet. The 6th avenue front will be used as a receiving station and other parts for storage and manufacturing purposes.

A RESIDENT of Helsingfors, Russia, is evidently endeavoring to make fishing easy. He has just taken out a patent in this country on a device which is described as follows: "An apparatus for facilitating the capture of fish? by killing or stunning them by means of an electric shock, consisting of an electric induction-coil whose primary winding is in circuit, through a switch normally open, with a battery or other source of electric energy, and whose secondary winding is connected on the one hand with the fish-hook through an insulated conductor in one with the fishing-line, and on the other hand with the water through a conductor immersed therein, so that on closing the switch an electric current generated by induction in the secondary winding of the coil will pass thence through the insulated conductor, the fish-hook, the body of any fish which may have seized said hook, the water, and the immersed conductor back to said secondary winding." We think that there will be little demand for this invention, at least in this country by true lovers of the sport, as it would be too much like hooking and drawing in inanimate bodies, and would do away with the excitement of "playing" a fish.

## ANNUAL MEETING OF THE GENERAL ELECTRIC COMPANY.

(Special dispatch to ELECTRICITY.)

SCHENECTADY, N. Y., May 8, 1900. The annual stockholders' meeting of the General Electric Company was held here this afternoon. About the only business transacted was the election of the following Board of

Directors for the ensuing year:
Gordon Abbott. Boston.

Gordon Abbott, Boston.
Oliver Ames, Boston.
C. A. Coffin, New York.
Thomas Jefferson Coolidge, Jr., Boston.
Thomas .A Edison, Orange, N. J.
George P. Gardner, Boston.
Eugene Griffin, New York.
Henry L. Higginson, Boston.
J. Pierpont Morgan, New York.
J. P. Ord, Schenectady.
Robert Treat Paine, 2d, Boston.
George Foster Peabody, New York.
Charles Steele, New York.

## Meeting of the American Society of Mechanical Engineers.

The American Society of Mechanical Engineers will hold its 41st meeting in Cincinnati from May 15 to 18. The headquarters of the Society will be the Grand Hotel. During the Convention the following papers will be read:

Geo. I. Rockwood. "On the Value of a Horse Power; "H. T. Yaryan, "Hot Water Heating from a Central Station;" W. S. Aldrich, "Systems of Efficiency of Electric Transmission in Factories and Mills;" J. J. Guest, "Design of Speed Cones;" Robert H. Thurston, "Multiple Cylinder Engines;" Wm. T. Magruder, "The Gas Engine Hot-Tube as an Ignition Timing Device;" N. O. Goldsmith, "Water Softening Plant of the Lorain Steel Company; "M. P. Higgins, "Education of Machinists, Foremen and Mechanical Engineers;" Arthur Herschmann, "The Automobile Wagon for Heavy Duty;" M. E. Cooley, "A Test of a Fifteen Million High Duty Pumping Engine at Grand Rapids, Mich.;" W. F. M. Goss, "Tests of the Snow Pumping Engine at the Riverside Station of the Indianapolis Water Company;" B. C. Ball, "Cylinder Proportions for Compound and Triple Expansion Engines." Topical discussions: "What Does it Cost to Run Trains at High Speed?" "Protection of Pen-stocks from Corrosion."

#### Proposals Invited.

The Bureau of Supplies and Accounts of the Navy Department is inviting sealed proposals until May 15 for furnishing the Boston Navy Yard with one generating set. Specifications and blank forms of proposals will be furnished upon application to the Navy Pay Office at Boston or to the Bureau at Washington.

Sealed proposals are being invited until May 15 for furnishing and installing one electrical power plant in the Boston Navy Yard. Blank proposals will be furnished intending bidders upon application to the Navy Pay Office at Boston or to the Bureau of Supplies and Accounts, Washington, D. C.



#### THE PARIS EXPOSITION.

BY CHARLES LEMOINE.

(Special Correspondence of ELECTRICITY.)

The Paris Exposition consists of two sections lying across the Seine; these are joined by a series of buildings extending along the river on both banks. The section known as that of the Champs Elysées has on one side of the river the two principal buildings of the Exposition, the large and smaller palaces, one on each side of a fine avenue, which is continued across the river by a new bridge of handsome construction, called the Pont Alexandre III; from here the avenue continues, and is bordered on either side by a number of fine buildings whose facades are in staff and richly ornamented. Commencing at the bridge and extending along the left bank of the Seine is the series of national buildings, each presenting letter boxes, etc. The different floors will be occupied by State and National reception rooms and offices, with a lunch room in the rear. The pavilion will be surrounded on the outside by a series of incandescent lamps outlining the building, and will present a brilliant appearance at night. Farther on is the Army and Marine Building and on the opposite side the Horticultural Building that is devoted to the various congresses of the Exposition. Here the Electrical Congress will be held from the 18-25th of August. Farther along is found the Champ de Mars section, covering a large extent of ground. The central gardens are surrounded on three sides by a series of buildings, forming a continuous facade. The third side is formed by the Electrical Palace, a view of which will be seen in Fig. 1.

In front of the Electrical Palace is the electric fountain, which promises to be one of the

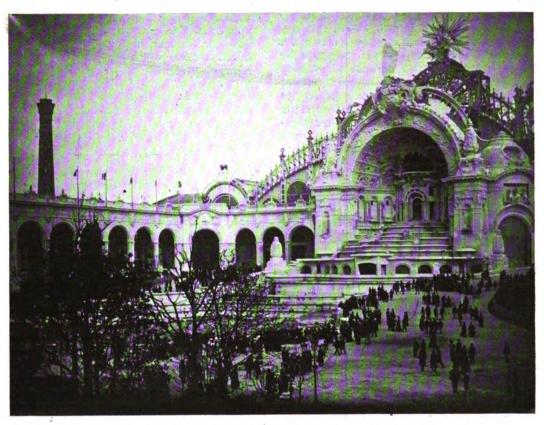


FIG. 1.—VIEW OF ELECTRICAL PALACE AND FOUNTAIN.

a different style of architecture, forming a unique and picturesque collection. The United States pavilion is one of the most important of the series, being situated between those of Turkey and Austria. It is built of white staff, being a square structure, surmounted by a dome of considerable dimensions ornamented with gold palm-branches. At the top is a gilded eagle. In front and overlooking the Seine is a portico in the classic style, having an arch on each of its three sides; under the outer arch is a colossal equestrian statue of George Washington in white staff. The roof of the portico is hemispherical and contains a handsome fresco of the Goddess of Liberty with the eagle and flag. Back of the portico an arched doorway leads into the main building and over this is another fresco representing the national industries and products. portico is surmounted by a quadriga with the Goddess of Liberty. The central portion of the building under the dome is of octagonal form, and is surrounded by galleries corresponding to the three upper stories. On the first floor is a model American post-office with attractive features of the Exposition. This consists of a large central arch, bordered on each side by an arcade containing an upper and lower gallery; these are joined on each side by the arcades which extend along the two sides of the grounds, as will be seen on the left. The fountain thus forms the central point at the extreme end of the grounds. Under the main arch is a large niche having an opening in the form of a grotto, and from the basin will fall a wide sheet of water into the series of basins seen below. On the ground level is a large basin extending out from the fountain for a considerable distance, from this will rise various sprays and jets of water, and the whole will be brilliantly illuminated from below by arc lamps giving different colors. The main fall will also be lighted by openings in the niche. The fountain is of white staff and is richly ornamented with reliefs and sculptured groups. At night it will no doubt give a striking effect. Back of the fountain rises the facade of the Electrical Palace, having a series of large windows in front, and surmounted by an ornamental crest. This is constructed in

metal-work and ceramics. At the top is a figure representing the genius of electricity drawn in a car by chimeras. Below is a tablet bearing the date 1900; behind the group is a large open-work star of gilded metal. The appearance of the facade is very handsome; it carries at the top a series of globes for are and incandescent lamps and will also be brilliantly lighted up from the interior.

The inside arrangement of the Electrical Palace will be seen in Fig. 2, which has been taken from the extreme end of the building. It is divided into three parts, the second floor extending across the middle part, as will be noticed in the background; this is reached by a wide staircase on each side. The central portion has on each side a large dynamo building, seen in the front of the figure, occupied by the machines for the lighting and power necessary for the Exposition. The building shown in front is occupied by the engines and dynamos of French construction, and a similar building in the rear contains those of foreign make. These dynamos and engines present a collection of widely varying types, and are arranged along each side of a wide central passage. In each building is a 25-ton electric crane. Each of the two dynamo buildings has back of it a boiler room which contains a series of boilers of different makes arranged on each side of a central passage. The boilers face to the outside, leaving the middle space free for the passage of coal cars. Under each range of boilers is an underground conduit which conducts the products of combustion from the furnaces to an immense smoke stack, which is 230 feet high and has 14 feet interior diameter. It will be seen on the left in Fig. 1. On the upper floor of the Electrical Palace are placed the different exhibits, and the long galleries extending along the dynamo buildings will also be used for this purpose.

To provide the necessary light and power will require about 20,000 kilowatts. In each of the dynamo buildings are about twenty directconnected units, giving 10,000 kilowatts. The engines have a total of 36,000 horse-power. The dynamos are in all cases mounted on the shafts of the engines, and are about equally divided between continuous and alternate current. The generators have a total capacity of 8,000 kilowatts, and the alternators give 1,270 kilowatts single phase; 500 diphase and 10,000 triphase. The power for the various exhibits, etc., will be supplied mainly by diphase and triphase motors. For the lighting of the buildings and grounds will be used 1,300 directcurrent arcs and 1,560 alternating, making 2,860 arc lamps in all, besides 10,000 incandescent lamps.

In Fig. 3 will be seen one of the large directconnected units in the German section. The engine has been built by Borsig, of Berlin, and is rated at 2,000 horse-power. It carries a Siemens & Halske alternator of 1,200 kilowatts. The field poles are mounted upon the flywheel, and the armature winding consists of a series of copper bars placed in slots in the interior of the crown. Next to this is another upright engine of German make, having on one side a Schuckert alternator of 500 kilowatts of somewhat the same design, and on the other a 14-pole direct-current machine of 400 kilowatts. Opposite these are two large units, the first being an upright triple-expansion engine, carrying on one side a Lahmeyer alternator of 500 kilowatts, and on the other a 12-pole generator of 350 kilowatts. It is followed by a Helios alternator of 1,000 kilowatts



with horizontal engine of the Augsburg type. The Belgian machines are represented by a Kolhen alternator of 500 kilowatts, and two others of 600 and 500 kilowatts. The Austrian machines include two triphase alternators of Ganz & Co.'s make, of 500 and 650 kilowatts, and one of Siemens & Halske, of Vienna, a 900 kilowatt generator. The Swiss machines present an interesting collection.

transmission. In the other dynamo building is a crane of the same capacity. It takes the form of an immense arch, running upon rollers at the sides of the building. The arch is braced near the top by the horizontal crossbeam on which the carriage travels, this having direct-current motors for propulsion and lifting. This crane is of German make, being constructed by Carl Flohr, of Berlin.

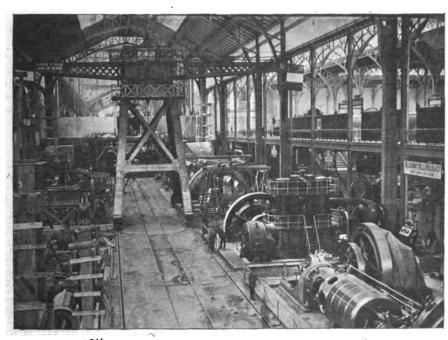


Fig. 2.—Dynamo Room, French Section.

Among these are two Oerlikon alternators of 250 and 500 kilowatts. Great Britain has three direct-current machines, the largest being that of Siemens Brothers of 1,300 kilowatts, with a Willans engine. Italy and Holland are also represented by a number of machines.

The French section shows a number of large machines of different types. Among these may be mentioned a Fines-Lille triphase alternator of 600 kilowatts, a Farcot alternator of 450 kilowatts, and the large alternator built by Schneider & Co. of Creusot, giving 800 kilowatts, coupled to a Dujardin engine. Paris branch of the Thomson-Houston Company has a large 675 kilowatt machine driven by an upright engine of Cail & Co.'s make. The Maison Breguet has a 500 kilowatt alternator, and next to this are two generators of 250 and 75 kilowatts built by the Postel Vinay Company on the Thomson-Houston system. An interesting group consists of a Laval steam turbine running at high speed; to this, by means of reduction gearing, are coupled two direct-current machines of the Breguet type. To supply current for the two large cranes, and for the lighting necessary for the erection of the machines at night, a gas engine plant has been placed in one of the dynamo buildings, consisting of two 60 horse power gas engines of the Charon make, driving by belt two small generators of 70 kilowatts each.

A large 25-ton crane of French construction is shown in Fig. 2. It runs upon a wide track formed by two rails side by side with a rack between; a pinion carried upon the crane gives the necessary movement, this being operated by an intermediate shaft passing from a motor placed above. On top of the main tower is a circular platform upon which a series of rollers is placed, permitting the horizontal beam to revolve, giving the crane a radius of 35 feet. The carriage is operated from motors placed in the center by chain

As to the exhibits, these are now being rapidly installed, and there is no doubt that in a few weeks the whole second floor of the Electrical Palace will present a finished appearance. The United States has a fine pavilion, which occupies a considerable space. It is

marble bust of the Emperor Francis Joseph. Here are seen a number of interesting exhibits, such as telephones, telegraph instruments and Ganz & Co. has an extensive collection of triphase motors and transformers, and Siemens & Halske show a series of small directcurrent motors, fuse-blocks, porcelain insulators and switches. A model of the underground conduit system of Buda-Pesth is also shown, with miniature electric cars. The Pollak accumulator is represented by a number of types of cells and plates. In the German section the Allgemeine Gesellschaft are erecting a large pavilion of repoussé copper and stained glass, and Siemens & Halske has a smaller one of carved wood. Among the French exhibits which are now in place, that of the Dussaud loud speaking telephone and phonograph attracts considerable attention. An interesting collection of bare wires and cables is shown by Lazare Weiller, of Havre. The Gaiffe Co. has an extensive exhibit of electro-medical instruments of high-tension apparatus. The galvanoplastic exhibit of Christople & Co. contains a number of objects of art, bronzes, etc., reproduced by this process. The Leclanché Co. has a collection of batteries, and the St. Gobain glass works shows a new form of white glass which replaces marble for switchboard panels and instrument bases. The Transportation Building will contain a number of electric cars and automobiles; a part of this section will be located at an extensive annex to the Exposition, which has been arranged at Vincennes Park, in the suburbs of the city. Here will be installed a number of exhibits containing cars, trucks with motors and automobiles, and American firms will be well represented. For the automobiles special arrangements have been provided and a large race-track has been laid out, besides all the necessary accommoda-

ber of exhibits in place. In contains a life-size

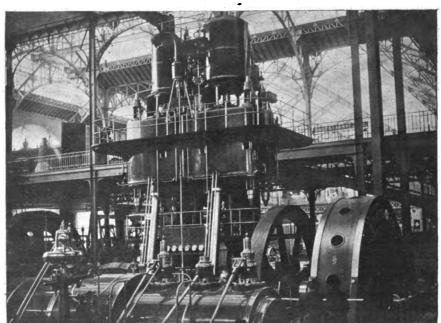


Fig. 3.—Borsig Engine. Siemens & Halske Alternator.

built of white staff, consisting of a colonnade in the Corinthian style, with arched doorways. It contains a series of reception rooms, and here will be seen an interesting exhibit of historic electrical apparatus, arc and incandescent lamps, models of dynamos, measuring instruments, etc. Next to it is a German pavilion of novel construction, built also of staff, and ornamented with metal-work designs.

The Austrian section has the greatest num-

tions for the automobiles of all systems. A charging station is provided, with facilities for repairs, etc. The Paris Automobile Club will conduct an extensive series of tests and races, and will award diplomas to the successful competitors. This promises to be one of the interesting features of the Exposition.

The Exposition is to be well supplied in the way of communication by telegraph and telephone. Several telegraph offices have been in-

stalled, and throughout the grounds are a number of public telephone boxes, by means of which communication may be made to the city circuit. A convenient system has been adopted by which the message is taken down by an attendant at the receiving station and delivered to any address. The grounds will be well lighted by arc and incandescent lamps. For the arc lamps, a number of handsome poles have been erected. Some of these have a cast-box at the base to contain a transformer; they are fed by the high-tension system, direct or alternating. On the Alexandre III Bridge are a series of artistic bronze candelabra, each having four globes of moulded glass containing four incandescent lamps. At each end of the bridge are two very long and handsome candelabra of antique bronze, with a group of several figures supporting the base.

#### GAS VS. ELECTRICITY FOR LIGHTING PURPOSES.

BY J. R. CULLINANE.

I assume the above subject was assigned to me for some good reason, but I wish to assure you that I have had no experience in selling either gas or electricity in competition; on the contrary, nearly my whole experience has been in selling both articles at the same time to the same class of patrons. I will endeavor to tell you something about selling gas and electricity from this standpoint.

It is a hard matter to adjust the prices of both articles on an equal basis, especially is this so in a small city where there is a demand for flat rates. Flat rates are a nuisance where the company using them is also selling gas and electricity through a meter service. I will add flat rates are very unsatisfactory. In early days I asked a promoter of electrical plants (who in those days usually represented some large manufacturer) why he asserted a six andle power incandescent lamp sold at a certain price was all we could get for it, he replied that we must meet the prices at which we were then selling gas, and he added that the demand for electricity had to be met irrespective of its cost. Indeed, he was uncertain as to its cost. Of course we all know more now as to its cost than we did then, but I have often observed that a great many of the plants in Texas established their prices in the same way, and probably for the same reason. The fair and equitable way to sell electricity is through meters. In the gas business the meter is used exclusively; the manager of a gas company can tell you his leakage, his yield and exactly what it costs him per thousand cubic feet to make or deliver his gas; hence he can deliver his product on a basis through meters so that every foot of gas sold brings in pro rata profit.

In the electrical business we should do the ame thing. We should know our leakage and what it costs to generate and deliver the current per thousand watts. To do this we should measure the current as we send it out through large station meters, and then sell it exclusively through meters to our customers. All flat rates should be avoided. The investment in meters will be large, but I think the ability of the plants to sell to a large number of customers, and thus save additional machinery, will fully repay for the investment in meters. The early prices of electricity were established to

compete with the then existing prices of gas. Gas at \$2 per thousand cubic feet was figured out equal to current at 20 cents per thousand watts, or one cent per ampere hour, and the flat rates were adjusted accordingly.

Assuming the prices of gas and electricity adjusted on an equitable basis, we will pass to the next problem, that of handling the "dear public." If we find any of our patrons with any ideas as to the kind of light they desire to use we encourage them in their choice. We always endeavor to let them say what kind of light they shall use without any influence from ourselves.

Necessarily, the dual interests of a company selling gas and electricity for lighting purposes clash; but we find many places in our line of customers where only gas will serve the purpose, and other places where only electricity will answer. We always take advantage of these opportunities to keep the interests from encroaching on each other and at the same time increase the growth of each business.

In the lighting business exclusively each kind of light has its particularly good points. In the management of a company selling gas and electricity we find other territories besides the lighting business in which to sell our products, and in these we find the dual interests do not clash.

Our sales of gas for cooking purposes in no way affect or decrease our sales of electricity; to a dual company this is a wide field; forty per cent, of our gas is sold to this class of business. and the percentage is always growing. I can remember only a few years back when gas companies had only a small part of their output going through gas stoves. We have another large field for the sale of gas through the medium of the instantaneous water heater This apparatus has reached a very high state of mechanical perfection, and the demand for them is growing. They are very satisfactory to the patrons of a gas company, and as they are very liberal in the consumption of gas, are also very satisfactory to the gas companies themselves.

By pushing the sale of gas in these two fields we do nothing to hurt our electrical business. The advent of the Welsbach burner brought joy to the gas man, but the Welsbach burner is in direct competition with electricity, and it is not my purpose here to discuss that side of the question.

As I stated above, I will endeavor to show you there are spots in the dual business that are not necessarily competitive.

I have stated a few of the fields in the gas business that can be pushed without hurting the electrical business. On the other hand, in the field of electricity we have a class of business that can be pushed that will not hurt the sales of gas. I have reference to the sale of current for use in small motors and fans. This is a very wide field and a very profitable one. The prices usually paid for power current are more remunerative than those paid for lighting purposes.

Nearly any electrical company can operate a power circuit successfully and profitably. The number of places that will use motors and fans is astonishing. To a company doing a dual business this class of business is of great assistance. Another field for selling current is in the way of advertising. You find many customers who spend money for electricity in different ways to advertise their business. Some will use arc lights and incandescent lights illuminating the outside of their stores and show windows; others working electrical devices and signs to attract attention to their stores. This is not in competition with the sales of gas, but brings in quite nice returns.

Further, by combining the business, if you can control the territory and avoid the awful prices usual where competitive plants exist, there is a hope for success. I am frank to say I often wonder how some of the competitive plants exist and sell their products at their prices. I think good management should mean good prices, and I don't understand how some of these competing plants can pay their actual operating expenses, to say nothing of fixed charges, interest, depreciation and repairs. I assume they know their business and are pleased with the results. Any way there is one set of people happy where there is competition in the lighting business; that is, my friends, the "dear public."

#### THE STEAM AUTOMOBILE.\*

BY J. A. KINGMAN.

The first steam automobile was built in France in 1769 by Nicolas Joseph Cugnot, a French military engineer, after his retirement from the army. He constructed two carriages, the first one of which was unsuccessful, either on account of the small size of the boiler or of inefficient feed pumps. The carriage could not run for more than a short distance without stopping to get up steam. It possessed considerable power, however, and once actually broke down a stone wall in one of its erratic movements. A second machine was constructed, which consisted of a three wheel vehicle, the boiler being placed in front and the fore wheel driven by a double-cylinder engine. This original carriage, together with an excellent model of the same, is now preserved in the Conservatoire des Arts and Motiers. In England Watt was apparently to much engrossed with other work to pay much attention to steam carriages, although he applied for a patent on a steam carriage in 1781. There is, however, no record of his having taken up the matter further. In later years Watt was opposed to steam carriages and would not let them pass his residence.

The first carriage built with the intention of using on common roads was that of Julius Griffith, built in 1821. The piping, pumps, engine, machinery, etc., were of excellent design and fine construction. The boiler, however, was so designed that it made the regular generation of steam impossible, as water was expelled from the tubes and could not be introduced. Sir Goldsworthy Gurney started his experiments in 1825 and built steam coaches until 1832. Gurney's steam coaches or drags were fitted with his patent water tube boiler and his slide valve engines. A feature of his boiler was a system of chambers or separators to prevent priming. Steam could be gotten up in about five minutes.

Walter Hancock was the most successful builder of steam carriages in England at this date. He built ten carriages, nine of them large omnibuses, and the last two carriages were successful in every way. Hancock began working on steam carriages in 1825 and continued his labors until 1840. The boiler employed by Hancock consisted of a series of chambers arranged vertically. The engine had two cylinders and was placed vertically, the circular motion of the crank-shaft being communicated to the

<sup>\*</sup>A paper read at the 204th meeting of the New York Electrical Society, New York City, March 22, 1900.



<sup>\*</sup> A paper read at the annual meeting of the Southwestern Gas, Electric and Street Railway Association, Waco, Texas, April 13, 1930,

rear axle by a chain. It is stated that Hancock was the first steam carriage builder to run his carriages in the streets of London, where they were operated without noise, smoke or appearance of steam. Hancock's carriage ran between London and Paddington for five months. In 1840 the subject of steam locomotion in England on common roads ceased to be a matter of public interest, and from this time on we do not find any marked development otherwise than that of the traction engine. The steam automobile in America has resulted in one type only, viz., that of the light pleasure carriage. Particular attention may be called to the Overman-Crouch, Whitney and Thompson vehicles, together with the locomobile designed by F. E. and F. O. Stanley. The Overman steam carriage is supplied with a steam boiler and a slide valve engine. Steam is exhausted into the hollow tubes of the running gear and passes into the atmosphere through small holes drilled in the front axle. The level of the water in the boiler is kept at the same height by means of an automatic controller. The motor is set to run at a constant speed, and different carriage speeds are obtained by clutches. The Crouch steam carriage employed super-heated steam and has proven a very good steam carriage, but considerable difficulty is experienced from the fact that the engine shaft is set rather high and the chain is apt to break when the carriage is traveling over a rough road. The Whitney steam carriage has undergone considerable change since George E. Whitney built his first vehicle. All these carriages mentioned are of the same general type, using a small water tube or fire tube boiler, which is fired by gasoline, and the steam used in a small steam motor of simple design.

In the "locomobile" steam carriage gasoline is used as a fuel and is stored in a copper tank holding three and one-quarter gallons: the storage tank is placed under the foot-board and the fuel is forced by compressed air through the boiler where it is vaporized to the burner and ignited. Power is communicated by means of the chain from the engine sprocket to the larger sprocket on the rear axle. A strut of variable length keeps the engine shaft parallel to and always the same distance from the rear axle. There are twelve teeth on the engine sprocket and thirty on the rear axle sprocket, consequently it takes two and onehalf revolutions of the engine to produce one revolution of the wheels. A steam pressure of 160 pounds is carried and a pop safety valve blows off at 225 pounds pressure. Exhaust steam is muffled in a copper tank and passes through a flue in the water tank to the atmosphere. The burner is of extremely novel design, and one of the most interesting features of the carriage. It consists of two plates connected by 114 short copper tubes and is encased in a short metal cylinder. The upper plate is pierced with 2,280 capillary holes; twenty of these holes surround the opening made by each copper tube. The gasoline having been vaporized, by passing through two of the boiler flues, is forced by compressed air from an atomizing nozzle into a bell-mouthed mixing tube. The proper mixture of air and vapor having been obtained, combustion takes place above the upper plate. The combustion chamber is about three inches deep. The fire is automatically regulated. When the steam pressure reaches 160 pounds a diaphragm presses against a spring, the movement of which closes a needle valve, thus reducing the supply of fuel. This burner is placed directly below the boiler and gives a blue flame of perfect combustion, and is operated without odor or noise. Steam pressure may be obtained within less than ten minutes from the time of lighting the fire. In some cases it takes as short a time as four minutes to get sufficient steam to start.

Several of the best scientists of this country have made the unqualified statement that steam is the best power for motor carriages. Steam is our best known power and the one most used. A number of the most important advantages of steam for motor carriages may be briefly stated as follows: 1. Great power may be stored in small space. 2. An entire absence of objectionable features may be obtained. 3. Great power. 4. Elasticity of steam. This is, perhaps, the most important advantage and must not be undervalued. The reserve force in the boiler makes it possible to develop a great power for a short time, thus the carriage may be propelled through a very bad piece of road or up an unusually steep grade. 5. Speed. The speed is only limited by the position of the road and may be varied as desired. The particular advantage of throttling the steam is that any speed may be obtained from 0 to the maximum. This makes it very convenient in crowded streets.

#### A DEVICE FOR PREVENTING THE DE-STRUCTION OF IRON PIPES BY ELECTROLYSIS.

It is only necessary to listen to the complaints emanating from various communities to get some idea of the great amount of damage that is being done to underground pipes by electrolysis. This question appears to have developed within two or three years a comparatively new feature and one which it seems is of no little importance. We refer to the resistance of joints in water and gas mains.

Were it not for this fact there would be a chance of dealing with the problem through some of the methods proposed, but as it is practically impossible to electrically bond the joints of the piping system now underground of any city, for reasons that are obvious, it would seem that relief must come from the trolley roads finding some other method than the ground return before a complete remedy can be looked for.

It may be well just here to turn our attention to new pipes that are constantly being laid, and see if at least there may not be some method of protecting them.

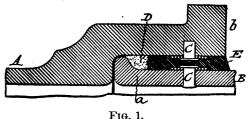
In looking over the patent records of the United States for the past few years, which is generally a good indication of what engineers and inventors are doing, we find only three or four patents that bear on this particular case. All of them, with one exception, which we will refer to later, are devices for bonding electrically the joints of pipes from the *outside* of the main, in a similar manner as the joints of rails are now bonded.

It would seem that such devices could not be depended upon for continual electrical contact any more than the present rail bonds, owing to the corrosive effect of constant moist earth in which they are buried, besides the difficulty and expense of applying the same.

A patent above referred to, however, was issued on April 3 to Mr. A. A. Knudson of this city, who, it is well known, has devoted much time and work to this subject, which for novelty, cheapness and ease of application is well worthy of attention.

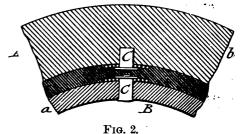
The object of the invention is, first, to prevent the shunting of stray electric currents around pipe joints, and second, to provide a method of electrically bonding pipes that ensures a permanent connection and one that will not deteriorate in time through oxidation. Figs. 1 and 2 are sections of a packet joint and illustrate how the device is applied. At the factory where the pipe is made or upon the ground before the pipe is laid the pipe sections A and B are each provided with a non-oxidizable electric contact C, shown in detail in Figs. 3, 4 and 5.

In making use of this device the pipe is laid

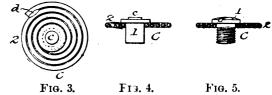


In the ordinary manner except that care should be taken to see that the contacts are clean. The jute stuffing, D, is then introduced and the joint caulked with lead.

As described in the patent the spigot end and the bell end of each of the pipe sections A and B are provided, respectively, with external and internal contacts C (Figs. 3, 4 and 5), so arranged that they may be brought into coincidence with each other, as in Figs. 1 and 2, and electrically connected with each other



by the lead packing E. Two pairs to each pipe joint are represented; but one pair is considered sufficient in most cases, and in some cases a single contact at each joint may suffice, especially if the opposing surface be scraped bright immediately before pouring the lead. The form of contact represented in these figures comprises a rivet-shaped attaching portion 1, having its head provided with a central boss c to protect the remainder of its surface, which is intended to receive the patentdate, a license-number, or the like. In applying a contact to the spigot end of a pipe-section the socket to receive such attaching portion 1 is conveniently drilled through, and the attaching portion is then riveted in place, as



represented in Figs. 1, 2 and 6. Within the bell the attaching portion 1 is driven tightly into a drilled socket of sufficient depti.. The protruding portion 2 is formed by a normally-flat spiral washer of wire, having the outer coils united by solder, as at d, Fig. 3, to preserve the washer shape. A washer of this description is readily conformed by bending to a convex surface and conforms itself to one that is concave, and by admitting the lead be-

tween its coils affords a large contact area within a small space. The fastenings d of two contacts may, moreover, be readily broken, if desired, in making a joint, and the wires may then be uncoiled and twisted together to render the hard-metal connection continuous. Contacts of such description may obviously be used for bonding riveted steel pipes and for other purposes.

The contacts C in common are preferably of tin or of tinned copper, because sufficiently inexpensive and at the same time non-oxidizable, and adapted to form a perfect electrical contact with iron and with molten lead; but any metal that is a fairly good conductor of electricity may be used. They are applied in all cases after the pipe has received its asphalt coating, so as not to be covered thereby.

That the Knudson pipe bond accomplishes that for which it was intended is forcibly demonstrated by a number of tests that were recently made by the well-known electrical



Fig. 6.

engineer, Mr. Elmer G. Willyoung, for Mr. Francis Forbes. The object of the tests was to ascertain the electrical resistance of joints bonded and not bonded. The pipes were 8 inches in diameter. Each line consisted of four lengths, thus permitting readings to be taken at three joints. The tests were made by the well-known "Fall of Potential" method, the two lines of pipe being joined in series with a two-cell storage battery and a Weston D. C. ammeter. The drop of Emf. was obtained by a Weston millivoltmeter. The result of the tests expressed in ohms is as follows,

Joint not bonded.	Bonded.
.005943	.000107
.009749	.000103
.003483	.000080

The results obtained are most striking, and show that where the bond is employed the "joint" resistance is many times less than in the case of the plain joint, which would effectually prevent any stray electric current that might happen to seek a line of pipe from being shunted around the joints.

It would seem from this that the inventor's idea is, that as we are bound to have more or less trolley current flowing through water and gas mains, we can at least so bond a joint that it will stop the shunting effect. Were proper returns provided for a railway circuit so

as to keep down the flow of current to and from such mains to a minimum, Mr. Knudson's invention would seem an important step in the right direction, at least so far as new pipes are concerned.

#### OPERATION AND MAINTENANCE OF STREET RAILWAYS.\*

BY H. F. M'GREGOR.

I hardly know what is expected of me by the association. The subject, "The Operation and Maintenance of Street Railways," affords scope enough to write a book, but consideration for my hearers and my own inclination will limit me to a few observations growing out of the experience that I have had in such matters as I feel may be useful to others, or as may invite discussion, with some comments and criticisms on current conditions added thereto.

The last decade has witnessed revolution and annihilation; the nightmare of the succession being about the only reminder of the motive power of the past. Invention has crowded invention. The electrical apparatus of yesterday is a back number to-day. The standard of to-day, if we dare yet talk of standards, is likely to be obsolete to-morrow. The procession has moved rapidly, and but few of us have had properties financially able to keep pace with it. Our experience, like our machinery, is obsolete; it was expensive, but is perhaps worth all it cost, and whether we were willing victims or forced, there was no choice; we could not stand still. Investors in street railways and other electrical plants have contributed large sums to the march of events, and those that come after us will consider it money well spent, and those that went through the transition find themselves cautious and self-reliant, two essentials to-day in the successful management of electrical properties. There was something to warm the cockles of the heart in the motive power of old that is lacking in the modern method. Perhaps the kinship of flesh and blood, or the theory that blood is thicker than water, for looking backward, is there a street railway man who can picture that he was at one time or another a brother to the sire of the lamented but not forgotten mule that shared our burdens?

I should have profited by the knowledge of the habit of our neighbor across the border, and have said, in answer to the suggestion of your committee, Manana, for "to-morrow." I am hoping for several standards in the construction, operation and maintenance of street railways adapted to all classes and conditions. Systematic and thorough work in this direction is what I believe is needed most by railway interests, commencing with franchises, proper municipal demands, standards for material and equipment for cities of different classes. Everything now is based on what is accomplished in large rcities, municipal exactions are the same, and the public mind is educated by object lessons from cities glutted with traffic where the problem is how to handle it, and not how to create business, where the horn of plenty exists, and is not an iridescent dream.

At the national convention I ventured to remark that the trend of the discussion was toward conditions existing in but few cities,

and inapplicable to the wants of most of the members, and suggested a division that would profit the smaller interests, I see from the published programme that at the next national convention we are to have a paper on construction, operation, and maintenance of roads that operate twenty cars or less; this is a step in the right direction.

The improvement demands no spoliation by the courts; municipalities and legislatures menace the very existence of street railways in cities under 50,000 inhabitants, or cripple them so they are unable to maintain the public service as they desire or should do. This should be remedied by proper education of the public mind, and no one can better do it than the street railway people and allied interests, working out with mathematical precision the results that can be obtained under given conditions. I believe we now have had sufficient experience to do so, and it is only a matter of compiling same, and getting it properly before the people, as an aid to the successful development of improved city and suburban facilities, and as a convincing answer to the craze for municipal ownership and social-

In the operation of street railways I recommend the belt system as being more profitable, covering more territory at the same operating expense; affording greater protection against accidents over a double track-system, and with less delays and annoyance over a switch system.

In cities of the class of Houston we average a car for about every 2,500 inhabitants. In smaller cities it would vary from this number to one for every 5,000 people. With us the travel amounts to one fare daily for less than 20 per cent. of the population. The operation of these cars should have close attention and every effort made to encourage and increase travel. Attractions on lines operated on a business basis are desirable, and free shows are not beneficial; those of a class that should be encouraged cannot be afforded free on a fivecent fare. It is preferable to give people full value for their money in attractions, concerts, etc., say ten cents admission and ten cents for reserved seats. Where the attraction is inexpensive in character the admission charge might include a coupon for refreshments at the privilege stands.

We operate our cars by the usual methods, and have no patent process better than others. Eternal vigilance is the price of success, and if not success, of the privilege of living.

Our headway varies from five to thirty minutes on different lines. On short lines it is desirable to have short headway. Formerly our outside limit was twenty-minute service. but we find half-hour cars earn about the same money on light traffic lines, and that fifteen minute service does not increase the travel but slightly and only to a small percentage of the increased expense of another car. Patrons on long headway lines time themselves until it becomes a habit, and the domestic arrangements at home are systematized accordingly. Twenty dollars per car per day is required for operation and maintenance of a proper standard of excellence, and the profit must come from earnings above that.

For the economical maintenance of a line it should be constructed well in the beginning. The rail should be sixty-pound or heavier; the heavier the better; base of rail not less than five inches in width to prevent cutting into ties. The joints should be cast welded.

<sup>\*</sup>Abstract of paper read at the annual meeting of the Southwestern Gas. Electric & Street Railway Association, Waco, Texas, April 13, 1900.

#### Electric Park in Kansas City.

The Heim Electric Park at the east end of the Heim electric line in Kansas City, Mo., is now nearing completion and will be opened May 27th.

Fifteen acres are being utilized for the park and at night, when the shrubbery is all in place, lighted up by the myriads of vari-colored electric lights, the effect will be fairy-like and dazzling.

The supreme attraction will be the electric fountain, which is to cost \$20,000. This fountain will throw 4,000 gallons of water a minute, sending it over 100 feet in the air.

Underneath the waterfall a stage has been erected twelve feet square, where all kinds of serpentine and skirt dances will be produced while the fountain is playing. This will be the most novel feature about the fountain, and it is believed that there is only one other similar to it in the United States. This is the one at Washington park, Philadelphia, that was built last year.

The floral designs throughout the park will be one of the main features. Several of the flower beds will represent the United States flag, and one the globe. This last is said to be a very delicate piece of work. The globe will first be made out of wood, filled in with four inches of moss and earth. On one side will be reproduced, in flowers, the map of the United States—the other side the Philippine Islands. All these floral effects will be illuminated at night with small electric lights of many colors. In fact, the lighting of the park is to be one of the most brilliant features. The grounds will simply be flooded with electric lights of every description. Experts will have charge of the floral and electrical displays and they have able assistants to second their efforts. In addition to these other features there will be a realistic German village, similiar in every way to the one that delighted so many thousands at Chicago. Inside of this a fully equipped café and dining hall will be put in running order.

# Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended May 5:

Alexandria, 2 cases, \$340; Antwerp 13 cases, \$1,793; Argentine Republic, 64 cases electric motors, \$4,388; Australia, 13 cases, \$1,792; Bremen, 1 case electric motors, \$18; Bristol, 2 cases, \$125; British West Indies, 62 cases electric motors, \$937; Brussels, 3 cases electric motors, \$62; Central America, 78 cases electric motors, \$199; 2 cases, \$82; Christiania, 1 case, \$93; 1 case electric motors, \$32; Cuba, 20 cases electric motors, \$910; Danish West Indies, 2 cases electric motors, \$26; Genoa, 11 cases, \$6,971; Glasgow, 11 cases, \$1,490; Hamburg, 86 cases electric motors, \$10,978; Havre, 19 cases, \$1,262; 378 cases electric motors, \$10,946; Hayti, 1 case electric motors, \$20; Japan, 70 cases electric motors, \$9,993; Liverpool, 198 cases electric motors, \$20,236; London, 169 cases electric motors, \$6,533; Mexico, 178 cases electric motors, \$8,934; Naples, 61 cases electric motors, \$4,000; Peru, 31 cases electric motors, \$6,649; Riga, 3 cases electric motors, \$716; Southampton, 7 cases electric motors, \$2,894; 48 cases, \$765; St. Petersburg, 1 case electric motors, \$198, Stettin, 60 cases electric motors, \$1,829; Venezuela, 23 cases electric motors, 478; Zurich, 5 cases electric motors, \$315.

#### NATIONAL ELECTRIC LIGHT ASSOCIA-TION CONVENTION.

# The Papers to be Read and Topics Discussed—Plans of the Local Reception Committee—Headquarters at the Auditorium Hotel—Transportation.

The Twenty-Third Convention of the National Electric Light Association will be held at the Auditorium Hotel, Chicago, May 22-24. Papers on the following subjects will be

read and discussed:

"Uniform Accounting," Lieutenant James Blake Cahoon, Syracuse, N. Y.

"Equitable, Uniform and Competitive Rates," Henry L. Doherty, St. Paul, Minn.

"Series Enclosed Alternating Arc Lamps," Prof. William Lispenard Robb, Hartford, Conn.

"Exhaust Steam Heating," Col. F. A. Copeland, Lacross, Wis., and Harry J. Frith, Watseka, Ill.

"Combination Electric Lighting Power and Railway Work," R. S. Feicht, Pittsburg, Pa. "Automobiles as a Source of Revenue to

Central Stations," Elmer A. Sperry, Cleveland. "Central Station Economies," W. L. Abbott, Chicago.

"Alternating Current Generators," H. G. Reist, Schenectady, N. Y.

The topic "Free Wiring" will be introduced and discussed by Mr. Chas, R. Huntley, of Buffalo, N. Y.; Mr. E. L. Bemiss, of New Orleans, La., and Mr. Dudley Farrand, of Newark N. J.

The question of municipal ownership of electric lighting plants will be discussed, and a report will be made regarding the progress of the investigation of municipal plants, and plans formulated for the continuance of this work.

#### ENTERTAINMENT.

The following gentlemen form the Local Reception and Entertainment Commmitte, Louis A. Ferguson, chairman; B. J. Arnold, C. E. Brown, F. E. Donahue, H. R. Hixson, A. O. Kuehmsted, C. A. Munson, J. B. Wallace, F. B. Badt, F. H. Clark, Edward B. Ellicott, Samuel Insull, W. W. Low, Julian Roe, G. S. Whyte, George C. Bailey, Norman Collins, C. E. Gregory, E. B. Kettle, A. D. Lundy, Thomas I. Stacey, J. R. Wiley, Charles T. Boynton C. D. Crandall, Arthur Hartwell, F. W. Kohler, G. H. McKinlock, B. E. Sunny and James Wolf.

This committee has arranged for a general reception at the Auditorium parlors on Monday evening, May 21st; for an automobile ride for the ladies on Tuesday morning, with luncheon at the Washington Park Club; on Wednesday, a shopping tour in the morning and a matinée in the afternoon; on Thursday, the Art Institute and Public Library will be visited in the morning, and a matinée in the afternoon.

The Auditorium Hotel has been selected as the headquarters of the Association. Hotel rates will be as follows. On the American plan, \$4 per day and upward; on the European plan, \$1.50 per day and upward.

#### TRANSPORTATION.

The Trunk Line Association, the Central Passenger Association, the Southeastern Passenger Association and the New England Passenger Association, have granted a special rate of a fare and one-third, on the certificate plan, for the round trip, from all points in their territory, for delegates and friends attending the convention. This rate is good for three days (not including Sundays) preceding and the

three days following the adjournment of the convention.

When purchasing your ticket, ask the agent for a certificate showing that you have paid full fare going, and this certificate, when properly visé at the office of the secretary of the Association, will enable you to buy your return ticket at one-third the regular rate.

A special train for the Eastern delegates will be run over the Pennsylvania Railroad, details regarding which can be had by application at the office of the Association, 136 Libery street, New York.

#### CANADIAN NOTES.

(From our Ottawa Correspondent.)

The Railway Committee of the Dominion Government has passed a bill giving to the Thousand Island Railway Company the power to generate electricity and engage in mining operations.

Surveys have been started to locate the line of the Greenwood & Phoenix (B. C.) Tramway Company, a distance of seven miles. Electricity will be used.

The Sunderland Electric Power Company of Sunderland, Ont., has been incorporated to supply light and power. Messrs. James Mc-Dermott and Henry Baldwin are directors.

The Brantford Electric Light Company of Brantford, Ont., is having plans prepared for the construction of a new lock, and has under consideration the installation of an additional 600 horse-power water-wheel and an auxiliary steam plant.

Incorporation has been granted to the Capital Power Company, of Ottawa, with a share capital of \$300,000. The company will deal in water power, electric and other motive powers. The provisional directors of the company are W. J. Conroy, O. H. Conroy, John McBain, J. C. Browne and R. J. Devlin.

It is seldom that such a representative gathering is brought together as that of last week in answer to invitations sent out by the Shawinigan Falls Water & Power Company of Montreal. There were representatives from the Cramp Shipbuilding Company, the Westinghouse Electric Company and other firms, while there was also a large contingent of bankers, engineers, capitalists and men of position. The main objective point of the party, the Shawinigan Falls, was, until very recently, an almost unknown wilderness, but to-day it is being talked about all over, for an enterprising company is harnessing the immense water power there, which is said to be second only to Niagara both in point of power and beauty. The property of the company comprises some 900 acres, part of which' is reserved for mill sites, while about 500 acres will be turned into a model town site. Inside of a comparatively few years this spot is expected to be a hive of industry, and even at this early date the sites have been secured for five manufacturing concerns. The conditions for generating power are almost ideal, the fall of the river being about 150 feet, and the total available power is estimated to be about 100,000 horse-power, but this will only be brought into use gradually. A large canal, with a power capacity of 50,000 horse-power, is being constructed for the upper basin of the river to the edge of the hill, where it ends with cencrete bulkheads. From this point the water is conveyed by immense iron pipes laid along the face of the hill to the power-house, 130 feet below. The work was



begun last July, and has been pushed all winter, so that it is expected that the first 5,000 hp. generator will be in place by November next. During next year the company expects to be in a condition to deliver power to Montreal on a large scale at a figure hitherto unattempted. No interference in winter is anticipated from anchor ice owing to the absence of rapids in the river above the falls.

#### LEGAL NOTES.

The General Electric Company of Schenectady, N. Y., has filed in the United States Circuit Court a suit against the Vulcan Foundry Company and the Pawtucket Brass Foundry. The suit is based on a patent the electric company holds on an invention by Albert Anderson of Boston, which consists of new and useful improvements in trolleys for electric service. It is alleged that the defendants have been supplying trolley harps, trolley forks and other devices that are an infringement.

Judge Wheeler, in the United States Circuit Court for the Southern District of New York, has handed down a decision in the suit of the Thomson-Houston Electric Company against the Bullock Electric Company and the Bullock the Bullock Electric Company and the Daniel Electric Manufacturing Company, sustaining the patent of Elihu Thomson, No. 401,085, re-lating to electric arc rupturing devices. The lating to electric arc rupturing devices. The court holds that six combinations are infringed by the defendants' apparatus.

## Fort Wayne Creditors will Receive \$175,000.

Attorney Charles H. Worden, trustee for the old Fort Wayne Electric Corporation, which was succeeded after the death of Mr. R. T. McDonald by the Fort Wayne Electric Works, the present concern, is busy at work closing up the affairs of the old company. He says that the business affairs of the old corporation will be closed up possibly before June 1. Besides the preferred claims, which included salaries of employes and other creditors for smaller amounts, the indebtedness of the corporation was about \$715,000. The delay in settling has been owing to the suits pending before Judge Baker at Indianapolis. An agreement has been reached between the parties concerned whereby a settlement is looked for immediately, after which Judge Baker will make his decision. After these settlements shall have been made the affairs of the concern will be wound up and the duties of the trustees ended. Another dividend of between 5 and 10 per cent. will be ordered by the court, and when this dividend shall have been made the payments to creditors will reach about \$175,000 or nearly 20 per cent. of all claims.

#### PERSONAL MENTION.

Mr. James Ellicott Hewes, of the firm of Hewes & Penniman, electrical engineers of Baltimore, has been appointed electrical engineer for Hagerstown, Md.

Mr. E. A. Carolan, assistant manager of the foreign de partment of the General Electric Company, is now in India in the interests of his concern. He will shortly proceed to China.

Mr. Will Christy, of Toledo, O., has been appointed president of the Southern Ohio Traction Company.

Mr. Bradford H. Starr has been elected superintendent of the Ringing Rocks Electric Railway Company of Pottstown, Pa.

Mr. W. H. Girvin has been appointed division superintendent of the Central New York Telephone & Telegraph Company for Syracuse and Onondaga County.

Mr. Harvey D. Gonse, who has been assistant manager of the Hudson River Telephone Company's Albany office, has been appointed general manager of the Saratoga division of that company with headquarters at Saratoga, N. Y. Mr. Gonse will take his new position May 14. Mr. J. S. McClelland, who is now district manager of the company at Saratoga, will succeed him.

#### INCORPORATIONS.

The Constant Battery Company, Brooklyn, N. Y. Capital stock, \$100,000.

The United States Electric Railroad Light Company, Philadelphia, Pa. Capital stock, \$125,000.

The Tyrone Electric Railway Company, Tyrone, Pa. Capital stock, \$25,000. President, D. S. Kloss.

The Geneva Electric Equipment & Construction Company. New York City. Capital stock, \$10,000. Directors: Edgar Swain and Adolf Hirschfield, New York City.

The National Association of Electrical Engineers, Camden, N. J.-to supply information pertaining to electrical engi-Capital stock, \$50,000. Incorporators: H. A. Salter, R. M. Eaton and F. R. Hensell.

The Warren & Brookfield Electric Light Company, Warren, Mass .- to manufacture and sell electricity for lighting, heating, etc. Capital stock, \$55,000. Incorporators: F. Slater, G. M. Faulkner and T. C. Perkins.

The Orange County Gas & Electric Company, Middletown, Capital stock, \$300,000. Directors: Edwin T. Hanford, Frank P. S. Crane, George A. Swayzee, Henry M. Hayes and John H. Galloway, Middletown.

The West Jersey Electric Company, Camden, N. J.-to deal in electricity. Capital stock, \$40,000. Incorporators: R. L. Anderson of Haddonfield, D. L. Clever, W. S. Mostander and J. F. Harned of Camden, R. A. Sheets of Westmont.

The D'Olier Engineering Company, Camden, N. J.-to deal in electrical machinery. Capital stock, \$50,000. Incorporators: W. L. D'Olier, H. D'Olier, both of Philadelphia, and F. W. D'Olier of Burlington; D. J. Pancast, attorney, Camden.

The Huguenot Electric Light, Heat & Power Company, New Rochelle, N. Y.-to furnish electric light, heat and power in the cities of Mount Vernon and New Rochelle and in the towns of Mamaroneck, Pelham and East Chester. Capital stock, \$50,000. Incorporators: Ex-Judge John J. Crennan, Quinten A. Corwin and John H. Schoffeld.

#### COMMERCIAL PARAGRAPHS.

#### Removal Notices

We are requested to announce that the Siemens & Halske Electric Company has removed its New York office from 320 Havemeyer Building to 40 New street.

The Montauk Multiphase Cable Company has removed its offices from the 18th to the 19th floor of the American Surety Building, 100 Broadway, New York City.

We are in receipt of a letter from Mr. Major, the famous cement man of New York, in which he sets forth some very interesting facts about Major's Cement. The multitudes who use this standard article know that it is many hundred per cent, better than other cements, for which similar claims are made, but a great many do not know why. The simple reason is that Mr. Major uses the best materials ever discovered and other manufacturers do not use them, because they are too expensive and do not allow large profits. Mr. Major tells us that one of the elements of his cement costs \$3.75 a pound and another costs \$2.65 a gallon, while a large share of the so-called cements and liquid glue upon the market are nothing more than sixteen-cent glue, dissolved in water or citric acid, and, in some cases, altered slightly in color and odor by the addition of cheap and useless materials. Major's cement retails at 15 cents and 25 cents a bottle, and when a dealer tries to sell a substitute you can depend upon it that his only object is to make larger profit. The profit on Major's cement is as much as any dealer ought to make on any cement And this is doubly true in view of the fact that each dealer gets his share of the benefit of Mr. Major's advertising, which now amounts to over \$5,000 a month throughout the country. Insist on Major's. Don't accept any off-hand advice from a druggist. Always have a supply of Major's cements on hand. If you are at all handy (and you will be likely to find that you are a good deal more so than you imagine) you can repair rubber boots and family shoes, and any other rubber and leather articles, with Major's Rubber Cement and Major's Leather Cement. And you will be surprised at how many dollars a year you will thus save. If your druggist can't supply you it will be forwarded by mail; either kind.

#### ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 504 Broadway (Room 1204), New York City, also at 639 F street, N.W., Washington, D.C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N.W., Washington, D. C. Copies of any patent published can be furnished upon p ent of ten cents. When ordering give name, date and title of invention wanted.]

#### LETTERS PATENT ISSUED WAY 1, 1900.

#### ELECTRIC RAILWAYS AND APPLIANCES.

ELECTRIC RAILWAYS AND APPLIANCES.

648,432. Railway-Signal. Seymour C. Prentiss, Detroit, Mich. Filed June 10, 1898.

648,592. Street-Car Fender. Augustus W. Shank, Detroit, Mich., assignor of one eighth to Charles A. Berger, same place. Filed Aug. 11, 1899.

648,536. Means for Operating Switches in Electric Tramways. Andrew G. Sharrow, Philadelphia, Pa., assignor of two thirds to Samuel Baum and Adam Baum, Jr., same place. Filed Oct. 26, 1899.

648,834. Trolley. Christopher H. Bierbaum. Buffalo, N. Y., assignor, by mesne assignments, to the Bierbaum & Merrick Metal Company, same place. Filed Jan. 20, 1990.

#### ELECTRIC LIGHTS AND APPLIANCES.

ELECTRIC LIGHTS AND APPLIANCES.
648,516. Electric Lamp With Burner of the Second Class.
Karl Ochs, Berlin, Germany. Filed June 29, 1899.
648,517. Electrical Glow Light With Illuminating-Body of
Second-Class Conductor. Karl Cchs, Berlin, Germany.
Filed Sept. 16, 1899.
648,518. Electrical Resistance. Karl Ochs, Berlin, Germany.
Filed Sept. 16, 1899.
648,625. Electric-Arc Lamp. Henry V. James, Salford,
England. Filed Oct. 10, 1899.
648,635. Apparatus for Removing Deposit of Carbon from
Incandescent Electric-Light Bulbs. Ernest W. Cushing,
Middleton, Mass. Filed Nov. 29, 1899.
648,731. Apparatus for Electrically Lighting Lamps. Henry
C. Farquharson, New York City. Filed Sept. 5, 1899.

#### ELECTRICAL MACHINERY AND APPARATUS.

ELECTRICAL MACHINERY AND APPARATUS.

648.492. Thermo Electric Generator. John W. Harrison, Pueblo, Col. Filed Sept. 1, 1896.

648.493. Regulating Dynamo-Electric Machines. Edward M. Hewlett, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Oct. 27,1899.

648.494 Regulating Dynamo-Electric Machines. Edward M. Hewlett, Schenectady, N. Y., assignor to the General Electric Company of New York. Original application filed Oct. 27, 1899. Divided and this application filed Jan. 12, 1990.

648.529. Dynamo-Electric Machine. Edward W. Robinson, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Oct. 8, 1888.

648.543. Electrical Attachment for Hydrocarbon or Other Burners. Ferdinand Wilke, Akron, O., assignor of one-half to Charles A. Ley. same place. Filed June 10, 1899.

648.546. Electrical Measuring Instrument. Joshua F. Begole. St. Louis, Mo. Filed Sept. 28, 1899.

648.555. Electric Switch. William Ely, Providence, R. I. Filed Feb. 19, 1897.

Filed Feb. 19, 1897.

648.671. Switch for Electric Circuits. James T. Robb, New York City, assignor to the Mitchell Vance Company, same place. Filed Dec. 21, 1899.

648,696. Method of Controlling Electric Motors. Martin T. A. Kubierschky, Berlin, Germany. Filed Dec. 6, 1899.

648,874. Booster Apparatus for Systems of Electrical Distribution. Lamar Lyndon, New York City. Filed Nov. 22, 1899.

#### TELEPHONES AND TELEPHONE APPARATUS.

TELEPHONES AND TELEPHONE APPARATUS.
618,533. Connection-Counter for Telephone-Lines. Charles
E. Scribner, Chicago, Ill, assignor to the Western Electric Company, same place. Filed Jan. 7, 1899.
648,647. Latch-Drop Device for Telephone Switchboards,
Ernest E. Yaxley and Charles C. Cadden, Chicago, Ill.,
assignors to the Victor Telephone Manufacturing Company, same place. Filed Sept. 15, 1899.
648,805. Service-Meter Apparatus and Circuit for TelephoneSubstations. Herbert E. Shreeve, Boston, Mass., assignor to the American Bell Telephone Company, same
place. Filed Jan. 22, 1900.
648,815. Indicator for Telephones. Charles F. Black, Goshen, Ind. Filed Nov. 15, 1899.

place. Filed Jan. 22, 1909.

648, 85. Indicator for Telephones. Charles F. Black, Goshen, Ind. Filed Nov. 15, 1899.

MISCELLANEOUS.

648, 378. System of Electrical Distribution. Oskar Behrend, Frankfort-on-the-Ma'n, Germany. Filed Dec. 28, 1897.

648, 406. Graphophone-Reproducer. William Hart, Kirksville, Mo. Filed June 14, 1898.

648, 448. Electromagnetic Coil. Richard Varley, Jersey City, N. J. Filed Dec. 18, 1899.

648, 481. Electrical Resistance. Arthur W. Berresford, Westfield, N. J. Filed Nov. 9, 1899.

648, 482. Electric Clock. Walter J. Dudley, Somerville. Mass, assignor to the Bangor Electric Clock Company, Bangor, Me. Filed Jan. 39, 1899.

646, 489. System of Distribution. William L. R. Emmet, Schenectady, N. Y., assignor to the General Electric Company of New York, Filed March 10, 1899.

648, 501. Apparatus for Supporting Overground Wires. Carl J. Kronenberg, Aufderhole, Germany, Filed Oct.12, 1899.

648, 505. Electric Fishing Apparatus. Ivar W. J. Lindbohm, Helsingfors, Russia. Filed Feb. 12, 1990.

648, 659. Plonographo-Telephonic Announcer. John E. Evard, Indianapolis, Ind., assignor to the Union Scale and Manufacturing Company, Sacramento. Cal. Filed March 13, 1899.

648, 659. Plonographo-Telephonic Announcer. John E. Evard, Indianapolis, Ind., assignor of one-half to Arthur A. McKain, same place. Filed July 8, 1898.

648, 673. Electrical Apparatus for Surgeons' Use. Henry Schlesinger. New York City, assignor of two-thirds to Charles Graf, same place, and William E. Willmann, Hoboken, N. J. Filed Nov. 88 1899.

648, 850. Electrical Apparatus for Surgeons' Use. Henry Schlesinger. New York City, assignor of two-thirds to Charles Graf, same place, and William E. Willmann, Hoboken, N. J. Filed Nov. 88 1899.

648, 850. Electrical Apparatus for Burgeons' Use. Henry Schlesinger. New York City, assignor of two-thirds to Charles Graf, same place, and William E. Willmann, Hoboken, N. J. Filed Nov. 28, 1899.

648, 659. Electrical Apparatus for Burgeons' Use. Henry Schlesinger. New York City, assignor of two

DESIGNS.
15. Telephone-Instrument Case. William D. Gharky,
Philadelphia, Pa. Filed April 2, 1900. Term of patent 7

years.
32,616. Telephone Switch-Box. William D. Gharkey, Philadelphia, Pa., assignor to the Sun Electric Manufacturing Company of New York. Filed Feb. 17, 1899. Term of patent 14 years.



# GENERAL NEWS.

#### What is Going On in the Electrical World.

#### LIGHTING.

Alameda, Cal.—An election will be held June 9 to vote on the question of issuing \$10 erecting a new electric light plant. of issuing \$100,000 in bonds for

Anderson, Ind.—It is proposed to install an electric light plant in the new Christian Church that is under construction in this city.

Ashland, O.—F. E. Meyers & Brother contemplate the establishment of an electric light plant in their factory to cost \$25,000.

Blakely, Ga.—W. L. McDowell, city clerk, can be addressed in reference to a new electric light plant that is to be built here for which bonds have been

Bristol, N. H.—The Bristol Electric Light Company has increased its capital stock from \$8,000 to \$16,000, and will enlarge its plant. G. A. Emerson is presi-

Erie, Col.—An electric light plant is to be established here in the near future.

Franklin, Neb.—Arrangements are being made to put in an electric light plant here.

Galesburg, Ill.—The city council is discussing the question of establishing a municipal electric lighting plant to cost \$40,000.

Goldfield, Col.—The city council is discussing the question of electric lights.

Grand Island, Neb.—The prospects are good for the establishment of an electric light plant here.

Hallettsville, Tex.—The city council is discussing the question of erecting an electric light plant.

Herkimer, N. Y.—The board of trustees is discus-

sing the question of electric lights.

Jackson, Mich.—The Michigan Central will build a boiler shop and an electric light and heating plant here that will cost \$80,000.

Lakewood, O.—Bonds to the amount of \$15,000 have been voted by the citizens of this village for the pur-pose of enlarging the electric light plant. The im-provement will be started about June 1.

Lexington, Miss.—A company has been organized here to erect an electric light plant. Address H. W. Watson.

This town is agitating the ques-Marianna, Ark.tion of erecting an electric light plant.

Mt. Pleasant, Tenn.—This town is discussing the question of electric lights.

North Brookfield, Mass.—The citizens of this place are discussing the question of building or purchasing an electric light plant.

Norwalk, Conn.—The city council has been peti-loned to take steps toward establishing an electric light plant.

Oxford, Ind.—The electric light plant here was recently destroyed by fire. It will be rebuilt.

Phelps, N. Y.—Bids will be received here in July for electric lighting.

Republic, Wash.—A franchise has been granted F. C. Whitney by the county commissioners for putting in a complete electric light and water system here. A company is to be organized, and it is understood it will be backed by ample capital in Salt Lake. The cost of the plant will not be less than \$75,000.

Sparts, Tenn.—The question of an electric light plant for this place is being agitated.

Springfield, Ky.—A movement has been started to organize a company at this place for the purpose of erecting an electric light plant.

Welch, W. Va.—This city will issue bonds to assist in building an electric light plant and waterworks.

Windsor, Mo.—Plans are being prepared for the establishment of a new electric light plant at this place.

Woodhull, Ill.—This village has given a 20 year franchise for the establishment of an electric light plant.

#### STREET RAILWAYS.

Almont, Mich.—The common council of this place has granted a franchise to the Detroit, Rochester, Romeo & Lake Orion Electric Bailroad, and the road will be extended from Romeo to this village in the

Auburn, Mass.—If an electric railway is built from Southbridge to Worcester by way of this place and is managed by one company, people of this town are willing to stand half the expense of building the road.

Harrisburg, Pa.—A party of Duqueene capitalists, composed of C. D. Wiser, B. M. Davies, W. S. Bryan and T. V. Bay, has applied for a charter for an electric railway from this city to Sunbury, a distance of 54 miles. The capital stock is \$50,000.

Lake Bluff, Ill.—The officers of the new electric railway to be built from here to Fox Lake via Liberty-ville announce that they have secured nearly all the right of way from this place to Liberty-ville.

Lebanon, Tenn.-Investigation is now going on in

regard to building an electric car line from here to Alexandria.

Los Angeles, Cal.—An application has been made by Townsend Bros. for a franchise to build an electric railway at Long Beach.

Manle Rapids, Mich.—The citizens of this place are strongly in favor of the electric road which it is pro-posed to run through the town. They have subscribed \$4.000 and will add more to it.

Newport News, Va.—The consolidation of the Citizens' Railway, Light & Power Company, the Peninsular Railway, the Chesapeake & Hampton Roads and the Peninsular Light & Power, at this place, has been com-W. A. Post has been elected president of the consolidation.

O,hkosh, Wis.—The real estate board of this city has been granted franchises to build an interurban road between here and Berlin by way of Omro, Winneconne. Eureka and Wankan.

Philadelphia, Pa.—A meeting of capitalists was held in this city recently at which the subject of construct-ing a trolley railroad from Frederick, Md., to Gettyburg, Pa., a distance of seventy miles, was seriously considered. L. Victor Baughman is quite hopeful that considered. L. Victor Baughman is quite hopeful that the proposed road will soon be constructed.

Pittsburg, Pa.—There is some talk of the West Side Belt Line adopting electricity for suburban passenger t affic.

South McAlester, I. T .- A franchise for an electric railway between this place, McAlester and Krebs has been granted.

St. Louis, Mo.—It has been announced that the motive power of the Broadway cable line would be changed to electricity not later than May 15, and pos-

St. Johns. Ore.—The City & Suburban Street Car Company will change to electricity the steam motor line from Albina Junction to this place, a distance of five and one-half miles.

Troy, O.—There are prospects of an electric road from here via Casstown and Addison to St. Paris.

Toledo, O - Capitalists here have organized a synditoledo, O — Capitalists need have organized a syndi-cate to build a network of electric railroads, connecting this city, Sandusky, Cleveland, Tiftin, Tremont, Find-

lay, Port Clinton, and a number of other points.

Vandalia, O.—The village council granted a franchise to Mr. Wilson for the construction of an electric

#### MANUFACTURING.

Clifton Forge, Va.—The Clifton Forge Light & Water Company wants addresses of manufacturers of electrical storage batteries.

Denver. Col.-The Fire and Police Board recently let a contract to the Gamwell Electric Company of Chicago to install a new system for operating the fire and police alarms. The plan will be to operate them and police alarms. The plan will be to operate them from the wires of the electric company, instead of as at present by wet batteries.

Detroit, Mich.-The Datroit Citizens' Street Railway Detroit, Mich.—The Datroit Citizens' Street Kailway Company is building a storage warehouse, 41x140 feet one story high, to contain storage batteries of sufficient capacity to store the electricity necessary for running the cars for several hours in case of an accident at the power house.—The Edison Illuminating Company is again about to increase the size of its plant establishment of a storage battery sub-station on Miami avenue, at a cost of about \$150,000.

Menominee, Mich.—R. E. Jennings, H. Tideman, F. J. Drudell, and Enmas S. Jennings, all of this city are the incorporators of the Menominee Electric Manufacturing Company, recently formed to manufacture electrical appliances, etc., on a capital of \$28,000. This company succeeds the Menominee Electric & Mechanical Company. The plant will be increased in capacity.

New York City.—The Electric Pneumatic Power Company of this city will manufacture and sell electrical appliances and devices on a capital of \$100,000.

Philadelphia, Pa.—The Electrochord Company of this city, with Ctarles P. Fischer as the principal incorporator, was chartered a short time ago for the purpose of manufacturing the electrochord, an instrument which, applied to a piano, gives either a pipe organ or an orchestral effect.

Portland, Me.—The American Incandescent Company has been organized here for the jurpose of manufacturing and dealing in electrical apparatus, with \$100,000 capital stock.

St. Louis, Mo.—Bartel's Copper & Sheet Iron Works, 1,691 North 14th street of this city, wants to purchase an electric motor.

Syracuse, N. Y.-The H. P. Cameron Electric Company of this city was recently formed with a capital of \$10,000, for the purpose of manufacturing and selling electric and other appliances for street railroads and also other electrical apparatus and articles used in connection therewith.

Weehawken, N. J.—A factory in which a number of skilled workmen will be employed to manufacture electric supplies, is to be erected on Maple street in this city.

Wilmington, Del.—Another contract for cars is being finished by the Jackson & Sharp Co. for use on the island of Cuba. Workmen of the company have been

busy for many weeks filling the order, which is for 125 electric cars for the Havana Electric Bailway Company.

#### COMPANY MATTERS.

Albany, N. Y.—The board of directors of the United Albany, N. Y.—The board of directors of the United Traction Company is about to extend the traisformer house at Watervliet. Three rotary electric transformers and twelve static transformers will be added to the equipment already in position. Two rotary and three static transformers will be installed in a transformer house to be erected at North Albany. When these arrangements are completed the company expects to receive 2,000 electric horse power from the Mechanics-ville Hudson River supply at the transformer house at Watervliet and 500 horse power at North Albany.

Represent Ma—The Represent Electric Light

Brunswick, Me.—The Brunswick Electric Light Company has placed an order for a \$4 500 dynamo to take the place of two now in use at the station. An auxiliary steam plant is also contemplated.

Milwaukee, Wis.—The Falk Company of this city has made contracts amounting to \$300,000 for the rebuilding of some of the Kansas City street car lines, and for building an underground conduit on Eighth street for the feed wires. The company will do all the welding and special work, which consists in the construction of switches, force at struction of switches, frogs, etc.

Newburgh, N. Y.—The Consolidated Gas, Electric Light, Heat & Power Company of this place has voted to make extensive improvements to the plant. Machinery of \$17,000 value will be installed.

Ottawa, Ont.—The Ottawa Electric Company places the approximate value of its property destroyed at the recent fire in this city at \$300,000.

St. Louis. Mo.—A company known is the Bocker Carbon & Battery Company of this city will manufacture electrical machinery, with a capital of \$50,000.

Washington, D. C.—Plans are under consideration by the Washington Traction & E ectric Company providing for a single power station in this city. The plant is to be located at Great Falls and will be run by water power. At present there are eight stations in various parts of the District, which supply the electric power used in operating the eleven street railroad lines controlled by this company, and that which is consumed by the two electric lighting companies also under the

#### POWER AND TRANSMISSION PLANTS,

Florence, Ala.—A company of New York and Boston capitalists, which recently received from the United States Congress a charter to erect a power plant on the Mussel Shoals Canal, have representatives here for the purpose of making the final preparations. The plans of the company are not positively known, but it is Nine, the first canal up the river from Florence, 24 miles long, and extending this way, in which it will get a fall of more than 30 feet and develop semething like 30,000 horse power, enough so turn the wheels of every industry in North Alabama.

Tintic, Utah.—The Telluride Power & Transmission Company, which has been so successful in the operation of the big electric power plant of Telluride has arranged for the erection of a big plant here which will furnish power for the mines of this district and also electric lights for the city. L. C. Nunn is the local manager. local manager.

Worcester, Mass.-The overseers of the poor are worcester, Mass.—The overseers of the poor are considering plans for harnersing a mall body of water for power purposes. At the Home farm is a pond, covering two acres, containing a body of water that can be utilized for water power, and possibly be of considerable value to the city. This pond is a short distance from Boylston street, on the city land, and is held by a dam 20 feet wide. The water has a fall of 12 feet.

#### AUTOMOBILES.

Chicago, Ill.—If the plans of the promoters of the Hub Chicago, III.—If the plans of the promoters of the nuo Motor Transit Company here are carried out, 50 electric omnibuses will be running on established routes on scheduled time between the business and residence sections of this city within a short time. The mechanism is placed in each of the hubs of the four wheels, and the storage battery power being transmitted direct to this mechanism gives to each wheel an active indeto this mechanism, gives to each wheel an active inde pendent propelling power. designated as "Imperials." The autocars are to

New York City.—P. J. Daly, master workman of the Liberty Dawn Association of Cab Drivers, an-nounces that in a few weeks an automobile service substituted for the present horse drawn cab service at the Waldorf Astoria.

Penacook, N. H.—Mr. A. H. Hoyt, of this place and Colonel B. F. Drake, of Lakeport, are to manufacture automobiles here.

Trenton, N. J.-A corneration known as the Automobile Patents Exploitation Company, organized under the laws of this State with a capital of \$1,000.000, proposes to get control of various advanced patents, entering into the manufacture of automobiles, the rights on which will be disposed of to subordinate companies from whom royalties will be exacted by the parent concern.

Utics, N. Y.—The D. B. Smith Company of this city is said to have made preparations to build automobiles.



# THE TELEPHONE WORLD.

#### Telephone War Fast Approaching a Head.

The New York "Commercial" says that capitalists and promoters actively identified with telephone affairs, and who are vitally concerned in the outcome of the impending struggle, declare that within the next half year the country will be treated to the most bitter telephone war that has even been instituted.

The Bell's rival, the Telephone, Telegraph & Cable Company of America, is about ready to come out in the open to fight its enemy, and knowing this to be true the Bell Company has left nothing undone to contribute to the discomfiture of its young rival and strengthen its own position. When the declaration of hostilities is made the contestants will be pretty evenly equipped, but the public will no doubt receive the Bell's rival with open arms.

#### New Telephone Company.

The Eastern Telegraph & Telephone Company recently incorporated in Trenton, N. J., has absorbed the South Jersey Telegraph & Telephone Company, which holds a franchise in every county in South Jersey. The new company purposes to establish an exchange in Camden and to run lines throughout the county. It is proposed to charge commercial houses \$36 per annum and residences \$24 per annum. Steps are being taken to obtain a New York terminal.

The People's Telephone & Telegraph Company, which operates at independent exchange at Knoxville, Tenn., is sail to be contemplating the extension of its lines to Chattanooga. The company is preparing to enter the long distance field more fully during the present summer and fall than ever before. It is probable that application will soon be made for an amendment of the company's charter, which will permit it to operate in a wider field than at present. Although the directors and management of the company are always reticent as to their plans, it is known that this step is now in contemplation, and that plans are on foot extending their lines all the way to Chattanooga, and for completing the connections in upper East Tennessee, which were lost by the sale of the Morristown Telephone Company recently, including its toll lines.

Sealed proposals will be received at the office of the District Commissioners of Washington, D. C., until 12 m., Saturday, May 19, for furnishing underground telegraph and telephone cables for the fire alarm and police telegraph and telephone service in the District of Columbia. Separate bids will be considered for the several items enumerated. Specifications and blank forms of proposals may be obtained at the office or by addressing John B. Wight, John W. Ross and Lansing H. Beach, Commissioners.

The Iowa Telephone Company's monopoly of the Sioux City telephone business, which it has just secured by the swallowing of the Home Telephone Company, may be broken by the Black Hills Telephone Company, which has made application for a twenty-year franchise in Sioux City, apparently with a desire to establish a new exchange there. The rates the new company proposes to establish are much lower than the rates now in force,

It is stated officially that within thirty days the Long-Distance Telephone Company of Virginia will have its lines running into Richmond. This will put Richmond in telephonic communication with Virginia points as far West as the Hot Springs. The only link uncompleted is thirty miles, from Richmond to Louisa Court-house. The contract to complete this line within thirty days has been awarded.

The old war between the Bell Telephone Company, which operates the Iowa 'phones in Des Moines. Ia., without franchise or authority, and the independent mutual companies of the State, has been renewed. This time it has broken out in Indianola. Warren County and has already gone so far as to threaten the prosperity of one or the other of the companies in that city and county.

Cortland, N. Y., is to have an independent telephone company, which will be closely allied with the telephone company in Binghamton, and a new company which is working in Rochester. In other words, the promise of the local telephone men that they would furnish a county and State service seems to be coming true.

The Harrisburg (Pa.) Telephone & Telegraph Company has been organized. The company has an ordinance before the corporation committee of the council of that city.

The Bell and the People's Home Telephone Companies are both trying to connect with Woodlawn, Ala.

Public sentiment in Lynn, Mass., is in favor of competition in the telephone business.

#### Rivals for Telephone Franchises.

Three telephone companies have filed applications with councils for franchises in Reading, Pa. They are the Berks, the Independent and the Keystone, which operate lines in Norristown, Phoenixville and other places down the valley. All stipulate a reduced cost of the service and promise, in the course of time, to lay their wires underground.

#### The Independent Meeting.

The Independent Telephone Association of the United States will hold its next annual meeting in Cleveland on June 12, 13 and 14. Judge J. W. Thomas, of Chillicothe, Ohio, is president of the association.

### "Hello" Girls Happy.

A reduction in the working hours of its employes has been made by the New York & New Jersey Telephone Company. Instead of working ten hours a day the operators will be obliged to work but nine hours. The new order went into effect May 1. There was no demand for less hours made by the employes, but they are much gratified at the change. Operators in Jersey City, Newark, New York and Brooklyn, are included in the reduction of hours.

#### The Austrian Telephone System.

We are in receipt of an attractive little pamphlet from the Ericsson Telephone Company, 296 Broadway, New York, known as the Ericsson Series, Part Three, which we are informed will be mailed free of charge to persons interested in the subject. In it is to be found considerable information of value, and among other things the telephone situation in Norway and Austria is referred to. In speaking of the latter country the pamphlet says:

"The telephone system in Austria has always been held to

"The telephone system in Austria has always been held to be governed by the decree of the 16th of January, 1874, relating to telegraph lines, and therefore as within the control of the State. In the beginning, the use of the telephone was extended throughout Austria by individuals or private corporations, to whom the Government granted certain privileges for that purpose, limited as to time. Such concessions were made chiefly during the years 1881 to 1885, inclusive.

"Later, when the development of the telephone advanced beyond expectation, the Government decided to cease granting privileges of this character, and, at the expiration of the respective terms for which they were then outstanding, to resume those already granted.

"The telephone systems established under the concessions originally granted by the Government were recovered by the State upon the conditions especially reserved for that purpose in the grants, and this included all construction and apparatus erected by the grantees.

"The indemnity in such cases was agreed upon by arbitrators, one of whom was nominated by the Ministry of Commerce, one by the grantees, respectively, and the third by the two so nominated. The basis of such indemnity was taken in each case to be the original cost and labor of establishing the line, its present value, with a due allowance made for deterioration. The Government took possession on the 1st of January, 1863, of ten city telephone lines, with a total number of 4,248 subscribers. The aggregate amount paid for them by it was 1,400,000 florins (\$568,400).

"On the 1st of June, 1895, the telegraph and telephone

"On the 1st of June, 1895, the telegraph and telephone property of the Vienna Private Telegraph Company was acquired by the State. It consisted of twelve private telegraph stations and 7,700 telephone subscribers. The amount paid by the Government was 4,000,000 florins (\$1,624,000).

"By a decree of the Ministry of Commerce, dated the 7th of October, 1897, the principle of Government ownership of all telephone lines within the Empire was established, and under that decree, negotiations were had which ultimately restored to the Government such privileges as had been granted by limited concessions to individuals and corpora-All telephone property used for public service in Austria is now owned and controlled by the State. Private telephone conversations, lasting not longer than three minutes, are charged for as follows: Within the city or town limits, 10 kreutzers (4 cents); for a distance less than 50 kilometers (30 miles), 30 kreutzers (12 cents); for distances between 51 and 100 kilometers (30 and 60 miles), 50 kreutzers (20 cents); for distances between 100 and 150 kilometers (60 and 90 miles), 80 kreutzers (32 cents); for distances beyond 150 kilometers (90 miles), 1 florin (40 cents)."

There are 1,200,000 miles of copper wire used in telephone service in the United States, and 4,000,000 calls are received daily in the telephone exchanges of the country. The wire would girdle the earth at the equator forty-eight times, or reach from the earth to the moon five times.

#### Suit Against Telephone Company.

The city of Duluth, Minn., has begun its fight against the Duluth (Bell) Telephone Company by suit in the district court, to compel it to remove its wires and poles from the streets, its franchise having run out, and no new one having been secured. Some time ago the company brought suit in the United States Court to restrain the city from interfering with it, as the city had threatened to forcibly remove its poles and wires. The city has assumed the offensive in this suit in the hope of hurrying the matter through the courts and getting a final decision on it.

# The Western Telephone Construction Company's Assets Sold.

On the 28th ult., a syndicate purchased the name, patents, good will and all tangible assets of the Western Telephone Construction Company of Chicago from the receiver in the bankruptcy proceedings instigated earlier in the month.

There were a large number of bidders at the sale. The assets were divided into three classes, one of which comprised the patents, and when this item was offered, the bidding was quite spirited between the Western Electric Company and the American Electric Telephone Company, but the bid of the syndicate for the entire assets, was for a larger amount than the three separate offers combined, so the new concern got everything.

This syndicate is now incorporating a new company under the same name with a capital of \$250,000 and the business is to be operated at 153 to 159 South Jefferson street, Chicago, and they are now ready to fill orders:

We are assured that the subscribers to the stock of this new company are gentlemen of means, none of whom were connected with the old concern, and the business will not be hampered for the want of funds. The practical management of the business is in the hands of men who stand at the head of the telephone business and an effort will be made to operate the business on a very much larger scale than heretofore.

The Home Telephone Company, which has been in operation in Sing Sing, N. Y., for several years, has just gone through a reorganization. The old officers were all Sing Sing men. The new officers are L. M. Simpson, of New York, president, and W. S. Sisley, of Jersey City, secretary and treasurer. There has been a lively competition with the New York Telephone Company, which put its long distance instruments down to \$2 a month. Among new subscribers to the New York Telephone Company are the old officers of the Home Company. There is a rumor that the Home has been bought out by the New York company.

A British investigator, says the N. Y. "Sun," has been studying the motions of a telephone receiver diaphragm. They have long been known to be very slight, so small indeed, that many students of the subject have been led to think that the diaphragm does not move at all as a whole. The recent experiments show that the movement for barely audible sound is one and one-half millionths of an inch; for "comfortable" sounds the movement is about two millionths, while a movement of forty millionths results in uncomfortably loud sounds. When the diaphragm surges back and forth as much as one five-thousandth inch the telephone makes a deafening noise.

The House Committee on Post Offices and Post Roads authorized Representative Bingham to favorably report the bill including telephones with telegraph companies in the laws under which the Postmaster General fixes the rates for official messages.

The Ohio independent Telephone Companies' Association will hold its annual meeting in Cleveland on May 9 and 10. It is stated that in the neighborhood of 150 independent companies will be represented.

The Pacific Coast Telephone system made a net gain of 2,012 subscribers in April; total number connected April 30, was 73,196, of which 18,688 are in San Francisco.

#### TELEPHONE INCORPORATIONS.

The Wyoming Telephone Company, Dover, Del.—to construct and operate telephone lines in Wayne, Wyoming; Lackawanna, and adjoining counties of Pennsylvania. Capital stock, \$10,000.

The Ithaca Telephone Company, Ithaca, N. Y. Capital stock, \$10,000, Directors: John P. Van Ostrand, F. S. Bronson, Lansing G. Haskins, Fred C. Bloodgood, Mark T. Atchley, William Thomas and Arthur W. Sperry, of Geneva.



# SECURITIES. ELECTRICA

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electricity from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness: coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gon., general; g., gold; guar., guaranteed; inc., income: imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

# STOCKS.

PASSE	NG	ER R	RAILW	AYS.	,		PASSENGER RAILWAYS.							
		Capital	Stock.	Bate and Date of	Bate and Date of				Capital Stock		Bate and Date of			
FANS.	Par	Authorz'd	Issued.	Lest Div.	Bid.	Asked.	name.	Par	Authorz'd	Issued.	Last Div.	Bid.	Anked	
Albany, N Y May 7. United Traction		<b>9</b> 5, <b>000,00</b> 0	<b>\$5 000 000</b>	1 <b>½ % Q.</b> ,	124	125	Hartford Conn.—May 7: Hartford Street By. Co Hartford & West Hartford RB	100 100	\$4,000,000 1,000,000	\$300,000 347,000	3 % S., Oct.,	150	=	
(Consolidation of the Albany and Troy City Bailway.)						ļ	Holyoke Mass.—May 7. Holyoke Street Ry, Co	100	400,000	400,000	8 % A., June,	2073	212	
Allentown Pa- May 7:						۱.,	Hoboken, N. JMay 7.			1 000 000		150		
Allentown & Lebigh Val. Trac. Co Bridgeport, Conn—May 7:	ŀ	4,000,000	1,500,000	•••••	-	15	North Hudson Co. (N. J.) Ry. Co Indianapolis, Ind-May 7.	25	1,250,000	1,000,000	8 76,	100	-	
Bri Igeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	103		™Indianapolis Street Ry	· · · ·	5,000,000	5,000,000		88	833	
Baltimore Md.—May 7: a United Rail ways & Elec. Cocom.	. 50	24,000,000	18,000,000	•	181/4	181/2	Lancaster, Pa.—May 7 Pennsylvania Traction Co Lancaster & Cel. Electric Ry		10,000,000	9,900,000 <b>87</b> ,500			=	
Boston, Mass May 7: New England Street By	25	5,000,000	1,081,925	1 % Q., Jan.15,			West End Street Railway		•••••	***************************************	,	-	-	
North Shore Traction Cocom. North Shore Traction Copfd.	100	4,000,000 2,000,000			15 85 93	16 87	Louisville Ry	100		8,500,000	1½ %., April. 2½ % 8., Oct. 1,	78 110	79	
West End Street Ry. Co com. West End Street Ry. Co % pfd.	50	10,000,000 6,400,000 10,000,000	6,400,000	6 % 8., A. & O. 8 % % 8., Oct., '19. 4 % 8., Jan. 2 % % Aug. 99,	112 1443	94 114 145	Minneapolis, Minn.—May 7	100	2,500,000	2,000,000	27g 7g 8., Udi. 1,		***	
Brooklyn N. Y May 7:	100	10,000,000	1	7 Aug. 10,			Twin City Rapid Transitcom Twin City Rapid Transit? % pfd		17,000,000 8,000,000	15,010.000 1,712,200	13/4 % Oct.	€88/a 186	681 187	
Brooklyn City Ry		43,000,000	43,000,000		725	236 7234	Montreal, CanadaMay 7:	۱				2513		
6Brooklyn Heights Kalirosa	100	200,000 12,000,000	12.000.000	8% % Q., Jan.,	107 257	109 289	Montreal Street Ry. Co	100		6,000,000	8 % 8., <b>M. &amp; N.</b> 1% % 8., J. & J.	973		
eBrooklyn, Queens Co. & Sub. RB. Coney Island & Brooklyn RB.	100	2,000,000 2,000,000 4,750,000	1,884,200	2 % % Nov., 99	325	830	Memphis TennMay 7:		E00 000	500 000	***************************************	25		
Kings County Elevated Kings County Traction Co Nassau Electric Railroadpfd.	100	4,500,000 6,000,000	4,500,000	1 % July	75	80	Memphis Street Railway Co New Ha ven, Conn May 7:	. 100	<b>500,00</b> 0	500,000		-	-	
Atlantic Avenue Railroad  Brooklyn, B. & W. E. Railroad	.] 80	2,000,000 1,000,000	2,000,000		::	::	Fair Haven & Westville RR	26 100		2,000,000 1,000,000	8 % 8., Pept. 2% % A., July	89	41	
Buffalo N. YMay 7:				}	74	75	New Haven & Centerville	.  100	700,000	800,000	)	15	46	
Buffalo & Niagara Falis Elec. Ry Buffalo Railway Co	100			1 % Q. Dec., 59	99	100	New Orleans, LaMay 7	۱.,						
Columbus OMay 7.	100	8,000,000	8.000.00	1 % Q., Feb.	26	28	Canal & Claiborne RR. Co	100	1,200,000	1,200,000	4 % 8., July, 1 % % Q., Oct.	148 %		
Columbus Street Railroad					₹5	88	New Orleans Traction Co new com. New Orleans Traction Co new pfd. aCrescent City RRguar.	100	)		8 % S., Jan.,	85 201	96	
Charleston, S. C May 7 Charleston City Rv. Co	50	100,000	100.00	8 % S.			Orleans Railroadguar	100	2,000,000 500,000	2,000,000 185,000	8 % 8., Jan., 4 % 8., Jan., 1 % %., June, 1 % %. Oct.,	::	52	
Charleston City By. Co	26	1,000,000					St. Charles Street Railway New York—May 7:	50	1,000,000	1,000,000	1½ %. Oct.,	56%	67	
Chicago, Ill.—May 7 Chicago City Ry. Co	. 100	12,000,000	12,000,00	8 % Q., Dec. 81, '99	261	263	Central Crosstown RRoChristopher & 10th Sts. RRguar	100	600,000	600,000	2½ % Q.	270 175	800 185	
Cnicago & South Side R. T. RR Lake Street Elevated RR Metropolitan West Side Elev. Ry	.   100	) in non no	ni 10.000.00	Feb 28 1900.	8,	, 9 26	Dry Dock, E. Brdw'y & Battery RR dMetropolitan Street Ry. Co	100	1,200,000	1,200,000	2½ % Q., Oct., 1½ % Q., Nov. 2½ % Q., Feb.,1900	100 158	124 <sup>1</sup> 158 <sup>5</sup>	
Met. West Side El., pfd	.  101	15,000,000	0  9,000,00	8 % Q., Jan.	221		Bleecker St. & Fulton Fy. Ry. guar	r 100	JI YUK).UUU	900,000	24 % A., July, 24 % Q. 24 % Q.	230	86 240	
ANorth Chicago City BR	. 100	500,000	0 249,90 1,608.20	0	::	•••	## ## ## ## ## ## ## ## ## ## ## ## ##	100	1,800,000 1,000,000	1,000,000	)	45 45	201 400	
West Chicago St. RR. Co	100	0 20,000,00 1,250,00	0 18,189,00 624,90	11/4 % Q., Feb.	110 24	26	Ninth Avenue Kr.	100	800,000	748,000 800,000	4¼ % Q.	.05 198	205 210	
Union Traction Co pref	100	2,000,00	2,000,00	5 % B.	7.7	77	ASIxth Avenue RRguar Twenty-third St. R. R. Coguar Second Avenue RR.	. 1M	2,000,000 600,000	600,000 1 862 000	4½ % Q. 2% Q., Jan., \$1.75 p. sh. Feb.	400 199	465 201	
Cincinnati, Ohio May 7: Cincinnati Inc. Plane Rycom		1 000 000	575 00			<b>!</b> ::	Third Avenue RR	.   100	12,000,000	10,000,000	\$1.75 p. sh. Feb.	1:8	1061	
Cincinnati Inc. Plane Rypfd Cincinnati, Newport & Cov. St. Ry	50	150,000	150,00 8,500,00	)	83	89	*Union (Huck) berry) Ry	100		2,000,00		190	200	
Mi. Adams & Eden Park Inc. Ry	50	18,000,00	14,000,00 2,200,00	1½ % Q., Jan. 1½ % Q., Jan.	1243	12,	Newark N. J.—May 7: Consolidated Traction Co. of N. J	. 100	15,000,000	15,600,000		60	61	
Cleveland, Ohio May 7.			1		40	En	North Jersey Street Railway Co United Electric Co. of New Jersey	100		6,000,000 504,000	11% % A.	22 ×	29 24	
Agron, Bed. & Olev. Elec. By Oleveland City By Oleveland Electric By	100	n e non nor	7,600,00	8-5 % Jan. 8-5 % Jan.	100 87	50 101 £8	Pittsburg, Pa.—May 7: Allegheny Fraction Co	. 50	500,000	500,000		56	56	
Detroit, Mich.—May 7:	100	13,000,000	12,000,00	% % Q., Oct., '99	"	"	oConsolidated Traction Coom Consolidated Traction Copfd	50	15,000,000 9,478 850	9 000,000	2 %, Jan. 8 %, Nov.	25 6434	2/3	
Detroit Citizens' Street Ry	.   100		1,250,000 1,200,000		1003 175	1	pCentral Traction Co	50	1,500,000	1900,000	Nov.	1234	70	
Rapid Railway Co Deiroit Electric Railway	:		250,000 1,000,000		90	100	Ped yeal St. & Pleasant Valley By	50	8,000,000 2,500,000	1,900,000	837 %, Nov.		· · ·	
Wyandotte & Detroit River Ry  Dayton O.—May ?	100				100	110	Pederal St. & Pleasant Valley Ry Pgh., Allegheny & Man. Trac. Co Pittsourg & Birmingham Trac. Ry.	. 50	1,400,000 8,000,000	1,400,000	2%, %, July, 2%, Aug.	27	29	
City Railway Co			1,470,60	1 × 2 .	140 170	145	Pittsburg & West End Ry United Traction Coeom	BX R/	3,000,000	8,000,000 17,000,000	6 % A. 8 % %, Nov. 2 % %, July, 2 %, Aug. 1 %, Oct. 5 % A., June J. & J.	141	1113	
Oity Bailway Copfd People's Street Bailway	100	1,100,000	1,100,00	7 7 7 4.	114	115	United Traction Copref		8,000,000		J. & J.	513/	515	

# PASSENGER RAILWAYS. Capital Stock.

# TELEPHONE AND TELEGRAPH COS.

		Canital	Stock		1			1	Canada	Stark	<u> </u>		T
NAME.	Par	Capital Authors'd		Bare and Date of Last Div.	E3d.	Asked.	NAME.	Par	Capital Authors'd		Rate and Bate of Last Div.	BH.	
New Bedford Mass-May 7 Union Street Railway Co Northampton, Mass-May 7	100			2 %, Feb.	160	165	Boston, Mass May 7 American Bell Telephone Co Erle Telegraph & Telephone Co New England Telephone Co	100 100	50,000,000	28,650,000 10,804,600	1 % Q., Jan. 1 % Q., Feb. 20, \$1.50 p. sh. Feb	816 104 184	818 1043- 1843-
Northampton Street Rv	100	800,000	225,000	4 % A., June.	170	178	New York May 7.			İ	1	İ	
Omaha Street Ry	100	5,000,000	5,000,000	8 % A. and N.	55	65	American Telegraph & Cable Co  *Central & South Am. Teleg. Co  *Commercial Cable Co	100	14,000,000 6,500,000	14,000,000 6,500,000		91 104 165	107
Paterson, N. J.— May 7. Paterson Rv. Co	100	1,250,000	1,250,000	**********	54		Franklin Teleg. Co 2½ % guar. Erie Telegraph & Telephone Co	100 100 100	1,000,000	4,800,000	17 % Q 17 % Q 17 % Q 17 % A 17 % A 18 % Q 18 % Q 18 % Q	42 112	170 5) 118
Providence, R. I.—May 7; United Traction & Electric Co	100	8,000.000	8 000 000	⅓ %, Oct. '98	109	111	#Gold & Stock Telg. Coguar. 6 %. #International Ocean Tel Co.guar 6% Mexican Telephone Co	100 100	5,000,000 8,000,000		ix x &	118	128 11s
Philadelphia.—May 7							*New York & New Jersey Tel. Co *Pacific & Atlantic Telegguar. 4 %	100	2,000,000 5,000,000 2,000,000	8,728,000	2% % Q., Jan., '99.	. 160 50	8 25/4  162   <b>75</b>
Fairmount Park Trans. Co §50 pd. Mestonville, Man. & Fairmount Hest'nvi'e, Man. & Fairm't. 6 % pfd.	50 50 50	2,000,000 1,966,100	1,770,000  1,966,100	2 %, Dec. '19. 2% %, July 15, '19. 3 % S—July, '99.	28 47 75	24 48 76	*Postal Telegraph Cable Co  *Sout'n & Atlantic Telg. Oo.guar.5 %	100 25	15,000,000 950,000	15,000,000 559,525	2½ % Q., Jan., '99. 2 % S. 1 % Q. 2½ % S. 8 % S., Jan., '99.	95	100
aFairmount Pk. & Had. Pass. Ry. Union Traction Co \$12½ pd	FΛ	I BROON OVOICAL	900 000	8 % Feb. 1, 19.	75 3614	76 35%	†Commercial Union Telegraph Co Western Union Telegraph Co †Div. guar. by Postal Teleg. Co.	25	500,000	500,000 9 <b>7,87</b> 0,000	1 % B., Jan., '99. 1 % %, Q. Jan. '99.	81	813
ditisens' Passenger Ry	UV.	500,000	1192,000	to share w.	845	 451	Miscellaneous May 7:						
eFrankford & Southwark Pas. B fLehigh Avenue Ry. Co fLombard & South Street Ry	50 50 25		1 000 000	814 sha'e A—Apr. 9	90	901	American Dist. Teleg. (Phila.) Bell Teleph. Co. (of Canada.)		400,000 8,960,000	8,561,000	1 % Q. 2 % 8.	26 188 55	87
aPeople's Traction Co	50 50	10,000,000	†771,076 †6,000,000	\$9 share A, Mar. 96 8 %, A., April, '98.		:::	Chesapeake & Potomac Telep. Co Chicago Telephone Co Central Dist Prig & Telg.Co.(Pgh.).	100	750,000	750,000	*****	200 148	62 210 150
Germantown Passenger Ry Green & Coates Passenger Ry.	50 50 25	500,000	150,000	85.25 share—1898. 8 % Jan., 1898.	150 151	151 152	Empire & Bay States Telegraph Co. Hudson River Telephone Co	100	2,000,000	2,000,000	1 <b>% Q</b> .	75 120	76 125
APeople's Passenger Rycom. APeople's Passenger Rypfd. APhiladelphia Traction Co	50	750,000	277,402	\$2 p. sh., Oct. 98.	95	 96⅓	*Northwestern Telegraph Coguar Providence (R. I.) Teleph. Co Southern New Eng. Teleph. Co	50 50 100	2,500,000 8,000,000	2,500,000	2% X Q.		125
Ontinental Pass. Ryguar	50 50	1,000,000	400,000 580,000	6 % A—Mar., '98. 86 share—July, '98.	158	157	ELECTRIC LIGHT		<del></del>	EOTR	OAL MFQ	. 0	08
Philadelphia City Pass. Ry	50 50 50		475,000	\$7.50 share July '98 \$3.50 share July '98	208 100	20814	Boston, MassMay 7:					Ī	Ť
Philadelphia & Gray's Fy. RR Ridge Avenue Passenger Ry Philadelphia & Darby Ry.guar.	50 50	750,000	420,000 1200,000	\$12 share, July '98. \$2 share July, '98.	3,8%	309	Fort Wayne Electric trust receipts Ft. Wayne Elec Co. T. Sec. Series A.	25	• • • • • • • • • • • • • • • • • • • •	• • • • • • • • • • • • • • • • • • • •	••••	115 86	125 48
117th & 19th Sts. Pass. Ry. guar Thirteenth & 15th Sts. Pass. Ry.	50 50	1,000,000	1250,000 1835,000	1½ % S., July, '98. 811 sh. A., July, '98	300	240	General Electric Co. [old] . com.	100 100	18,276,000	18,276,000	2 % Q., Aug., 1898. 1% % Q., Jan., 1900		188
West Philadelphia Pass. Rv	50 50	1,500,000 750,000	1750,000	39.50 shre, July '98 \$10 share, July '98	26.1	268	TH. Elec. CoT. Secur., Series D. Westinghouse Elec. & Mig.Co.com. Westinghouse El. & Mig. Co. pid.	50 50	4.000.000	146,700 8,996,058	1% % Q., Jan.,	2×6 46 61	47 62
Rochester, N. Y.—May 7 Rochester Railway Co	100	5,000,000	5,000,000		17	18	Westinghouse El. & Mfg. Oo. assent. New York.—May 7;	50		8,195,126		42	-
Reading, Pa May 7					24		Edison Elec. Ill'g Co., New York *Edison Elec. Ill'g Co., Brooklyn	100 100	9,188,000 4,000,000	7,988,000 2,000,000	1½ % Oct., '98.	119	120
Meading Traction Co	50 50		850,000	Semi-an.,Jan. & Jy Jan., '98.	138	26	Edison Ore Milling Co	100	• • • • • • • • • • • • • • • • • • • •		••••	8 82	12 93
St. Louis Mo May 7		1,000,000	<b>‡1,000,00</b> 0	Jan., vo.				100	40,000,000 18,276,000	30,460,000 18,276,000	2 % Q., Aug., 1998. 1½ % Q.,Jan., 1900.	189	1887
Fourth Street & Arsensi Ry Jefferson Avenue Ry. Co	50 50	400,000	150,000 400,000	2 % Dec., 1888.		::	Kings Co. El. L. & P. Co	100 100	1,000,000 <b>2,500,000</b>	2,500,000	A. & O.	110	135
Lindell Ry	100	2,500,000 2,500,000 2,500,000	2,400,000 2,479,000 2,500,000	1¼ % Jan., '99. 1½ % Jan. '99.	::	::	Pittsburg, PaMay 7 Lilegheny County Light Co	100	500,000	500,000	J. & J.	166	172
Oitisens' RR	100	2,000,000 2,000,000	1,500,000 2,000,000	4 %, Oct., '98. 2½ %, Jan., '99. 1½ % Jan., '99.	**	::	Philadelphia, Pa.—May 7	50	800,000	800,000	<b>Q</b>	-	-
Missouri RR	50 50	1,000,000	800,000	20C., Dec., ov.	23 1/4	21	Edison Electric Light Co* *Electric Storage Battery Cocom.	100 100	2,000,000 8,500,000		******	144 80	1443 803
United Electric Ry 6 % pref. t. Louis & Suburban Ry	100 100	1,000,000	1,000,000	3 %, Jan., '99.	13	13%	*Electric Storage Battery Copfd. Northern Elec. Light & Power Co	100 10	5,000,000 550,000	550,000	*****	7# 18	88 18
Union Depot RR	100		4,000,000	8 % A., July, "9	••	::	Southern Elec. Light & Power Co Miscellaneous.—May 7:	10	187,500	187,500	••••	<b>#</b> 0	-
San Francisco, Cal. – May. Uslifornia St. Cable RR geary Street Park & Ocean RR	100 100			50c. monthly,	117	119	Bridgeport (Conn.) Elec. Lt. Co Missouri-Edison (St. Louis)com.	25	500,000	••••	****	47 20	48 21
Market Street Ry	100 100 100	18,750,000	18,750,000	32.50 share, '96. Q., 60c. per share.	611/2	68 % 16	Hartford (Conn.) Elec. Light Co Hartford (Conn.) Lt. & Power Co	25 100	850,000		••••	10 150	15 L
Scranton Pa - May 7			,		29		New Haven (Conn.) Elec. Lt. Cc Narragansett (Prov., R.I.) Elec. Co.	25 100 50	175,000 100,000 1,200,000	•••••	2 % Q., Oct.,	6 195 98	100
Beranton Railway Co m Scranton & Carbondale Trac. Co m Scranton & Pittston Traction Co	50 100 100	500,000	500,000		10%	30	Rhode Island Elec. Protec. Co Royal Elec. Co. (Montreal)	100	1,000,000			118 <u>-</u> 4 198	193
Springfield Ill-May 7:			1,000,000	*******			Toronto (Canada) Elec. Light Co Thomson-Houston Welding Co Woonsocket (R. I.) Electric Co	100 100 100	1,085,000	1,085,000	1% Q 1% % Q 8 % 8, Dec. i, 96.	12:1/4	1287 100 106
Springfield Consolidated By  Springfield O.—May 7	100	750,000	750,000			••	†On Aug. 17 last by a majority vot to \$20,827,200, of which \$18,278,000 is c	e of	the stock!	holders th	e capital stock we	105 as red t E-	
Springfield Street By	100	1,000,000	1,000,000		-	11	Recently acquired the Edison Illumny, the Municipal Electric Light	umir	asting Co.	of Brook	lyn and its constit	tuent	COM
Springfield, Mass.—May 7: pringfield Street Ry	100	1,200,000	1,166,700	3 % A.	207	212	ALLIE	D	INDU	STRIE	8.		
Toronto Canada.—May 7. Toronto Street Ry	100	6,000,000	6,000,000	137 57 8 2	97%	93	Boston MassMay 7:	1					Π
Montreal Street Bailway Co		4,000,000	4,000,000	1 % 8.	2517	252	Delaware Gas Light Copref. American Electric Heating Co	50 50	500,000 10,000,000	500,500 200,000	J. & J. J. & J.	73×	=
Washington, D. C.—May 7: Belt Ry. Co	50		500,000		1012	108	Street Ry. & Illu'g Propertiespfd. United Electric Securities Copfd.	100	4,500,000	1,248,700 1,000,000	\$2 p. sh. Jan. 26, '95 \$8.50 p.sh. Nov '59	::	100
Capital Traction Co  Columbia Ry. Co  Eckington & Soldiers' Home Ry	50 50	400,000	400,000	65c. per sh, Oct. 19, 6 % A.	85	105 	New YorkMay 7:						
Heorgetown & Tenallytown Ry Metropolitan RR. Co	50 50	200,000	200,000	2½ % Q.	15	16	Consolidated Electric Storage Co Safety Car Heating & Lighting Co Worthington Pump Cocom			*******	•-••	150	12 185
Worcester, MassMay 7.	100	8 000 000		-	81	0.)	Worthington Pump Copfd	100 100	5,500,000 2,000,000	5,500,000 2,000,000	7 % Å	100	110
*Worcester Traction Co6 % pfd. Worcester Traction Co6 % pfd. Worcester & Suburban Street Ry	100	2,000,000		8 % 8., Feb., '98. 4% %, 1867.	1147	82 106 85	Philadelphia PaMay 7 Electro Pneumatic Trans. Co	10	1,500,000			23/4	
Wilkesbarre, PaMay 7:							United Gas Improvement Coscrip. Welsbach Commercial Cocom. Welsbach Commercial Copfd.	100 100	10,000,000 8,500,000	*****		20 78	162 21 75
Wilkesbarre & Wyoming Val. Trac  * Unlisted. † Paid in. ‡ Full	paid	LOutst	anding	1%, Jan.,	25	29	Welsbach Light Co	5	500,000 525,100 500,000		2 X Q	46% 13%	463
b Consolidation Electric. Peo	t Fai	rmount Pa	assenger l	Ky, for 6 % on stock	nies	Wi wad	Pittsburg, PaMay 7:						
c Practically all shares owned	cons	iitueni an	d leased	companies assume	ed by	Union	Standard Underground Cable Co	106 1 <b>96</b>	200,000 1,000,000	200,000 1,000,000		175	180
d Lease to Frankford & Southv Leased to Electric Traction C	vark omp	Passenge:	r Ry. assu	med by Electric T	ractio	n Co.	Miscellaneous.—May 7: Barney & Smith Car Cocom.	100		1,000,000		1436	
f Controlled by Frankford & S g Leased to People's Passenger	outh Rai	wark Pass	pershare				*Barney & Smith Oar Copfd. Billings & Spencer Co	100 25		2,500,000	•	104 82	107
h Majority of stock owned by i Leased to Union Traction Con j Lease transferred to Union T	npar	ıy.	_	any.			Johns-Pratt Co Pratt & Whitney Cocom.	100 100 100	1,250,000	1,250,000	1%% Feb	9	58 109 4
r aceso mounterreu (O U DION T	acti	on compa	uy.			1000 7 0	Dunate & Whitney Co.	100	•••••	*******		40	50
ii Leaged to United Traction C	lam.	anwat a	rental of	\$10,000 per annun pavable semi-anni	nini Ugliv	rental	Stillwell-Bierce Coom.			••••			1 50
# Leased to United Traction C p.a. \$20,000 in 1899-1900 and \$30,000 declared as a dividend semi-annum h Dividend of 10 % guaranteed b Dividend of 6 % guaranteed b	omp per lly. by l	anyat a manum ti Reading T	nereaster, raction Co	payable semi-ann ompany.	n in l ually,	rental,	*Prati & Whitney Oopfd Stillwell-Bieroe Cocom. Stillwell-Bieroe Copfd. Shults Beiting Co	10			2 % bept 1,'99,	50 80	50 50 65

# BONDS.

PASSEN	JER R	AILWA	Y.				PASSENGER RAILWAY.						
NAME.	Amou		Due	Interest periods.	Bid.	Anked.	NAME.	Anthorized.		Dwe	Interest	Bid.	
Naka	Automorization.	Assaras	DES	portous.	Dias	Anaba		A STATE OF THE STA	Meded.	TO ASSO	periods.	10000	Asies
Albany N. Y.							New Orleans La.  Date of Quotation-May 7, 1900.		Marie ooo	1010	77. A.W		
Date of Quotation-May 7, 1900 The Albany Ry. CoCons. mtg. 5s.	\$500,000	427,500	1980	J. & J.	*1171/2		Canal & Claiborne RR cons mig. 6s. Crescent City RR		50,000 8,000,000	1899	M. & N. M. & N.	1051/6	****
The Albany Ry. CoGen. mtg. 5s. Watervielt Turnpike & RR. 1st mtg. 6s	750,000 850,000	875,000	1947	M. & N. M. & N.	*117 *125	1271/2	Orescent City RRCons. mtg. g. 5s. New Orleans City RRlst mtg. 6s. †N. Orl's City & Lake RRlst mtg. g. 5s.	418,500	899,000 2,599,500	1903	J. & D. J. & J.	108	112 118
Watervielt Turnpike & RR2d mtg. 6s. Troy City Railway Co	150,000	150,000	1919 1942	M. & N.		127	N. Orleans & Carrollton RR.2d mig. g. 6s. Orleans Railroad Co Cong. mig. 6s.	850,000	850,000	1907 1912	F. & A. J. & J.		
tInterest guar, by Albany Ry, Co.							†St. Charles St. RR. Co1st. mtg. 6s. †8428,500 in escrow to retire New Or-	800,000	75,000	1906	J. & D.		
Principal and interest guar. by lbany Ry. Co.					1		1890,000 outstanding.	710					
Baltimore Md.							New York. Date of Quotation—May 7, 1900.						
Date of Quotation- May 7, 1900 nited Electric Ry. Colst mtg. g. 4s	88,000,000	18,000,000			102	1021/4	Atlantic Ave. (Brooklyn)Imp. g. 5s. Atlantic Av. (Brooklyn).lstgen. mtg.5s.	759,000	1,500,000 759,000	1909	M. & S.	95 1071/ <sub>9</sub>	110
altimore City Pass. Ry 1st mtg. g. 5s.	14,000,000 2,000,000 1,500,000	2,000,000 1,500,000	1911	M. & N.	748/4 1187/8	75	TAtlantic Av. (Brooklyn)Cons. mtg. 5s.	8,000,000 12,500,000	1,966,000 7,650,000	1943	J. & D.	115	116
Saltimore Traction Co 1st mtg. 5s. Saltimore Trac. Co. Exten. & Imp. g. 6s,	1,250,000	1,250,000 1,750,000	1901	M. & S.	119 1041/2 121	120	Broadway & 7th Ave	500,000	1,500,000 500,000 1,125,000	1914	J. & J.	106 108 115	100
Sal, Trac, Co.No. Balto div.1st mtg. g. 5s Bal, Trac, Co. Coll, Trust,1st mtg. g. 5s. Baltimore Traction Co. Convertible 5s.	750,000 800,000			J. & J.	101		Broadway Surface	1,125,000 1,000,000 6,000,000	1,000,000	1905		105 116	117 106 117
Dentral Pass. Ry. Co	96,000 601,000	117,000 580,000	1912	J. & J. M. & N.	119	121	Brooklyn City & Newtown . 1st mtg. 5s. Brooklyn, Bath & W.E. RR.Gen.mtg.5s.	2,000,000	2,000,000	1939		115	116
Dity & Suburban Rylst mtg. g 54 Lake Roland Elev.,lst mtg. 58.	3,000,000 1,000,000	8,000,000 1,000,000	1922	J. & D.	118	117	Brooklyn O's Co & Sub'n let mtg. 5s.	250,000 8,500,000	250,000 8,500,000	1941 1941	A. & O. J. & J.	104 112	
All of the bonds of the above							Brooklyn, Q's Co. & Sub'n1st cons. 5s. Brooklyn Ranid Transit	7,000,000	2,750,000 5,181,000	1941 1945	M. & N.	107	****
ompanies, marked †, have been as- umed by the United Railways & Elec-							Cent P'k, N. & E. R. RR. 1st cons mtg. 4s	1,200,000	700,000	1902	J. & D.	101%	108
Boston, Mass.							Coney Island & Brooklyn RR. 1st mtg. 6s.	800,000	800,000	1908	M. & N. J. & J. J. & D.	125 101 117	108
Date of Quotation-May 7, 1900. Lynn & Boston RRlst mtg. g. bs.	5,879,000	8,702,000	1924	J. & D.	114	115	P. Dock, E. Bd'y & Bat'y R. gen, mtg. g.58 Dry Dock, E. Bd'y & Bat'y RRscrip 5 %. Eighth Av. RR. Co Cert. indebt. 6 %.	. 100,000	1,100,000 1,000,000	1914	F. & A.	102 108	120 105
Vest End Street RyDeben. g. 4%s. Vest End Street RyDeben. g. 4%s.	8,000,000 2,000,000	8 000 000	1902	M.& N. M. & S.	1041%	106	42d St., Man. & St. Nich. Av. 1st mtg. 6s.	,200,000 1,500,000	1,200.000 1,500,000	1910 1915	M. & S. J. & J.	1163%	117
†\$1,674,000 in escrow to retire outstand- g bonds of absorbed companies.		_,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					Metropolitan St Ry Co. S. m. cl. tr. S. S.	5,000,000 12,500,000	5,000,000 1°,500,000	1993 1997	M. & S. F. & A.	124 120	125
Charleston S. C.			- 69				Second Avenue Ry. Gen. cons. mtg. 5s.	800,000	800,000		J. & J.	120	121
Date of Quotation- May 7, 1900.	E00 000	477.000	1006	J. & J.			South Ferry RR. Co	1,500,000 850,000	1,500,000 850,000 5,000,000			116	117
Interprise Street RR	500,000 850,000	47,000		J. & J.	106		Twenty-third Street Rylst mtg. g. 5s.	150,000	150 000	1909	J. & J.	106	108
Chicago III.							Twenty-third Street RyDeb. 5s Union (Huckleberry) Ry1st mtg. 5s. !!Westchester Electric RR1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A J. & J.	118 110	116
Date of Quotation—May 7, 1900							†\$1,085,000 in escrow to retire gen. mtg. bonds.	500,000	300,000	1020	0. 0.0.		
bicago City Ry	6,000,000 400,000	4,619,500 400,000	1903	F. & A.	1013/4	102 <sup>1</sup> / <sub>4</sub>	184,850,000 in escrow to retire maturing obligations.						
Phicago Passenger RyCons. mtg. 6s. Phicago & So. Side R. Tlst mtg. g. 5s.	1,000,000 7,500,000	7,500,000	1929	J. & D. A. & O.			¶\$552,000 in escrow to retire 1st and 2d mtg. bonds.					-	
nicago & So. Side R. T	1,500,000 4,040,000 7,574,000	4,040,000	1932	J. & J. J. & J.	108%	109	%In treasury, \$80,000. ‡‡ Guar. by Union Ry. Co.						
etrop. W. Side Elev. Rylst mtg. g. 5s. orth Chicago St. RRlst mtg. 5s.	15,000,000	8,781,200 15,000,000 8,171,000	1942	F. & A.	96 106	98%	Date of Quotation-May 7, 1900.						ĺ
orth Chicago St. RR Cert. indeb. 6s. orth Chicago City Ry 1st mtg. 6s.		500,00C	1911	J. & J. J. & J.			Montreal St. Rylst mtg. 5s. †Toronto St. Rylst mtg. g. 4½s.	2,500,000 4,550,000	800,000	1908 1921	M. & S. M & S.		
orth Chicago City Ryconsol. 41/28. Test Chicago St. RR	2,500,000 4,100,000	2,500,000 8,969,000	1927	M. & N.	108	111	†885,000 per m. single track authorised. \$600,000 in escrow to retire 6s due in 1901.	17	2,200,000				
est Chicago St. RR Deben. 6s est Chicago St. RR Con. mig. g. 5s.	2,700,000 12,500,000	6,000,000	1911	J. & D.	101 1065/8	102 107	Philadelphia.					-	
W. Ohicago St. RR. Tunnel 1st mtg. 5s. †Redeemable at option on 60 da. notice.	1,500,000	1,500,000	1909	F. & A.		****	Date of Quotation-May 7, 1900			1000			
Funded debt assumed by Chicago W. v. By. Co., controlling interest of hich is owned by W. Chicago St. RR.							Continental Pass. Bylst. mtg. 6s Empire Pass. Bylst mtg. 7s	850,000 800,000	000 000	LIMBI	J. & J. J. & J. J. & J.	****	1.00
Subject to call after Oct. 1, 1899, at							Greene & Coates St. Ry	100,000 150,000 250,000		TAOT	J. & J.		****
10 and interest.  Assumed by W. Chi. RR. Co., lessee.							People's Pass. Ry	500,000 1,125,000	250,000 458,000 867,000	1911	J. & J. M. & S.	****	****
Int. guar. by W. Chicago St. RR. Co.							Phila. City Passenger Ry 1st mtg 5a	5,698,210 200,000	200,000	1948	J & .		
Cincinnati, O.  Date of Quotation—May 7, 1900							Thirteenth & 15th St. Rylst mtg. 7s.	1,800,000 100,000	1,018,000	1917 1908	F. & A. & O		****
in. New. & Cov.St. Ry. 1st Con.mtg. g.5s		2,500,000	1922	J. & J.	118%	114%	Union Passenger Bylst mtg, 5s.	500,000 29,785,000	500,000 29,724,876	1911 1945 1905	A. & O. A. & O.	****	*****
Mt. Adams & Eden P'k Inlst mtg. 6s. Mt. Adams & Eden P'k Inc. Cons.mtg.5s	46,000 100,000 581,090	100,000	1905	A. & O. A. & O.	108½ 114 108¾	104	West End Passenger Ry 'stratg. 7s. West Phila. Pass. Ry	250,000 750,000	246,000	1906	A. & O. M. & N.		****
o. Cov. & Cin. St. Ry1st mtg. 6s.	250,000 400,000	250,000	1912	M. & S. M. & S. J. & J.	121 1/2 1823/4	122½ 187	The trust certificates were issued to	100,000	750,000		24. 06 14.		
† Assumed by the Cincin. St. Ry. Co. 1\$250,000 reserved to retire 1st mtg. bds.	200,000	200,000	1902	0.00.			pay for the shares of the Electric and People's Traction lines purchased.						
Cleveland, O.							Pittsburg, Pa.						
Date of Quotation- May 7, 1900 rooklyn Street RR. Oo1st mtg. 6s.	***				1081/	100	Date of Quotation—May 7, 1900 Birmingham, Knox & Allentown6s.	500,000	500,060	1981	M. & S.	1111/2	
n. New't & Cov. St. Ry. Cons. mtg. 5s. eveland City Cable Rylst. mtg. 5s.	8,000,000 8,000,000	2,500,000	1922	M. & S. J. & J.	106%	114 %	Central Traction Co	875,000 1,250,000	875,000 1,250,000	1927	J. &. J A. & O.		
leveland Electric Ry.Co. 1st mtg. g. 5s. dumbus (O.) Cent. Ry 1st mtg. g. 5s.	2,000,000 8,500,000	2,000,000 1,249,000	1918	M. & S.	105%	106 107	*Duquesne Traction Co1st mtg. 5s. *Fed'l St. & Pleas. Val. Jack's Run5s. Fed'l St. & Pleasant ValleyCons. 5s.	1,500,000 50,000 1,250,000	1,500,000 50,000	1913	J. & J. J. & J. J. & J.		*****
last Cleveland RR	1,500,000 1,000,000 600,000	1,500,000 1,000,000	1910	M. & S. M. & N.		107%	Millvale, Etna & Sharpsburg58.	750,000 250,000	1,250,000 750,000 250,000	1928	M. & N. J. & J.	110	118
orain (O.) Street Rylst mtg. 6s. t. Ry. Co., Grand Rapidslst mtg. 5s.	200,000 600,000	200,000	1915	J. & J.			Pittsburg Traction Co	750,000 1,500,000	750,000	1927 1929	A. & O. M. & N.	112	113
\$1,900,000 in escrow to retire bonds of seorbed companies, marked a.	300,000	000,000	1912	0.42.			Pittsburg & West End1st mtg. 5s.	500,000 1,500,000	500,000 1,400,000	1922 1980	J. & J. A. & O.		
Interest guar. by Cons. St. Ry. Co. Detroit, Mich.							Second Ave. Traction Co	2,500,000 500,000	2,000,000	1984	J. & D. V. & S.	-E	• • •
Date of Quotation-May 7, 1900							Providence R. I.					0	
etroit Citisens' St. Rylst mtg. 5s. Wayne & Belle Isle Rylst mtg. 6s.	7,000,000 400,000	8,885,000 877,000	1902	A. & O.		1021/9	Date of Quotation - May 7, 1900						
e Detroit Ry	1,800,000	1,800,000	1925	J.&D.	105	106%	Newport Street ByCoupon 5s United Trac. & Elec. Colst mtg. g. 5s	50,000 9,000,000	50,000 8,260,000	1910	J. & D. M. & S.	116	110
New Haven Conn.							St. Louis.		0,200,000	00			118
Date of Quotation-May 7, 1100	#00.00a	200 200	1010	W			Date of Quotation-May 7, 1800						
w Haven St. Rylst mtg. g. 5s. w Haven (Edgewood Div.) lst. mtg. 5s. inchester Avenue RR—lst mtg. g. 5s.	600,000 250,000	600,000 250,000 <b>500,00</b> 0	1914	J & D	111		Baden & St. Louis RRlst mtg. 5s. Cass Ave. & Fair Gds Rylst mtg. 5s.	5000 000 1,600,000	250,000 1,600,000	1912	J&J	100	102 102
inhester Avenue RRDeben. g. 5s.	100,000	24,000		M&N	109		Citizens' Railway Colst mtg. 5s. Comp. Hts. Un. De. & Mer. Ter. 1st	2,000,000 1 900 900	1,500,000		J&J J&J	109 117	109

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Passenger Railway.								
	Ame	est.		Interest				
TARR.	Authorized.	Issued.	Due	periods.	B14.	Asked.		
St. Louis.  Date of Quotation—May 7, 1100  Jefferson Avenue Ry	400,000 1,500,000 1,000,000 400,000 125,000 75,000 2,000,000 2,000,000 800,000 500,000 1,091,000 8,500,000	1,091,000	1911 1916	M. & S. A. & O. J. & D. M. & N. J. & J. M. & N. F. & A. M. & N. J. & J. M. & N.	108 106 100  100 99% 108 80 106 116 1100 121	105 109 106 102  101 100 × 104 84 108 118 110 × 122		
San Francisco Cai.  Date of Quotation— May, 1900.  California St. Cable BRist mtg. g. 5e. If Perries & Cliff House Byist mtg. 6e. Geary St., Park & Ocean BRist. mtg. 5e. Market St. Cable By. Colst mtg. 5e. Market St. Cable By. Colst mtg. 5e. If Metropolitan By. Co	1,000,000 650,000 1,000.000 200,000 2,000,000 350,000 250,000 700,000 1,000,000	650,000 671,000 8,000,000 2,000,000 850,000 250,000 700,000 900,000	1914 1921 1918  1918 1912 1914 1912 1918	J. & J. A. & O. J. & J. J. & J. M. & S. M. & N.	114  126 ½ 105 ½ 115	117 117 96  107 		
Belt By. Co	500,000 500,000 200,000 500,000	450,000 500,000 200,000 500,000	1911	J. & J. A. & O. J. & D. J. & J.	182	••••		
Bridgeport Traction Co	2,000, ooo 5,000, ooo 6,000, ooo 8,000, ooo 15,000, ooo 2,000, ooo 4,000, ooo 6,000, ooo 55,000, ooo 550, ooo 1,250, ooo 6,500, ooo 1,250, ooo 1,000, ooo	1,688,000 8,548,000 2,800,000 2,866,000 572,000 8,800,000 4,981,000 4,981,000 4,981,000 4,981,000 4,980,000 1,000,000 1,000,000 1,000,000	1981 1988 1982 1982 1988 1988 1920 1938 1930 1919 1928 1928 1902 1981 1980 1987	J. & J. F. & A. M. & N. J. & D. J. & D. J. & D. J. & D. J. & J. &	108 118 104 112 115 111 <sup>1</sup> / <sub>4</sub> 115 20 80 119 110 <sup>1</sup> / <sub>4</sub> 108 105 <sup>1</sup> / <sub>4</sub>	110 105 118 1118/4 115/5 119/4 1103/4 1106		
ELEOTRIO LIGHT AND	) ELE	OTRIO	AL			08,		
Roston, Mass.  Date of Quotation—May 7, 1500  Delaware Gas Lt. Co.,lst m. 5e, g. Edison felec. fluminating Co., Boston  General Electric Co.,gold coup, deb. 5s  Pittsburg Pa  Date of Quotation—May 7, 1900	800,000 2,025,000 10,000,000	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	1922	J. & J. Quar.	106 167 116	•••••		
Allegheny County Light Co	\$00,000 195,870 4,812,000 15,000,000 5,000,000 2,000,000 2,500,000 5,176,000 8,000,000 5,000,000	4,812,000 2,188,000 5,000,000 2,500,00 5,176,00 6,108,00	1910 1998 1940 1987	M. & S.	110 109 124 122½ 100 120 102½	124		
Miscellaneous.  Date of Quotation - May 7, 1900.  American Bell Telephone	INDU		1908	J. & D.	1001/4  114 108	101  115 106		
Miscellaneous.  Date of Quotation—May 7, 1100								
American Electric Heating7s. Armington & Sims Engine Co	75,000		1942 1904	J. & J J & D.	106 115	25 107 127		

## NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16%@17c.; Lake, 17@17kc.; casting, 16%@17c.

The transfer books of the Amalgamated Copper Company closed May 7 for the annual meeting to be held June 4 and will reopen June 5.

The Brooklyn Rapid Transit Company will tear down the Sea View Elevated Railroad at Coney Island and rebuild it as a surface trolley line.

The suit of the Widener-Fikins syndicate to recover 30,000 shares of Pittsburg Consolidated Traction from Whitney & Stephenson has been discontinued.

The Hub Motor Company, with a capital of \$1,000,000, to manufacture motor vehicles of all descriptions, was incorporated at Trenton, N. J. on the 2d inst.

The United Traction Company of Albany, N. Y., paid its first dividend on May 1. It is 1½ per cent. on the new stock and equivalent to 5 per cent. a year.

It is stated that the stockholders of the Cincinnati Street Railway Company will be acted the company of the Company of the Company will be acted that the stockholders of the Cincinnati Street Railway Company will be acted to the company of the Company of the Company of the Company of the Company of the Company will be acted that the stockholders of the Company of the

be asked to authorize an increase of capital stock from \$18,000,000 to \$20,000,000. Judgment for \$26,019 was recently obtained by default against the Woolf Electric Disinfecting Company, formerly of 66 Broad street, this city, in favor of Hazen L. Hoyt, for money lent to the company.

The Southern Light & Traction Company reports for the year ended March 31 Net earnings, \$155,561; interest on bonds, \$81,339; balance, \$74,222. The surplus equals 4 64 per cent. on the outstanding stock.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 20@23; New York Electric Vehicle Transportation, 94@10; New England Transportation, 5@54; Gramophone, 45@50.

The Idaho Southern Railway Company was recently incorporated at Trenton, N. J., with \$5,000,000 capital. The company purposes to operate railways, telegraph and telephone lines in Idaho. James W. Adair, Edward S. Jacob and Harry S. Baltz of Jersey City are the incorporators.

The Duquesne Traction Company has declared a semi-annual dividend of \$1 per share, payable May 5. The Diquesne Traction Company is leased to the Consolidated Traction Company of Pittsburg, Pa., under a guaranteed rental of \$120,000, or 4 per cent. per annum on its capital stock of \$3,000,000.

The statement of the National Electric Company for the first nine months of its present fiscal year shows a net income of \$163 878, or at the rate of \$218,000 for the full twelve months. This amount—\$218,000—is equal to between 8 and 9 per cent. on the \$2,500,000 paid in on Philadelphia Electric stocks, or about 22 cents per share on the 1,000,000 shares.

For the purpose of funding the floating debt and providing working capital the Sprague Electric Company has mortgaged all its property, letters patent, plant, etc., to the Farmers' Loan & Trust Company, as trustees, for \$1,200,000, to secure an issue of gold bonds for that amount, due in ten years at 5 per cent. The property is located in this city and also in Bloomfield and East Orange, N. J.

The Boston "News Bureau" says: "The Boston Stock Exchange has placed in the unlisted department the stock of the American Telephone & Telegraph Company, when and as exchanged for the stock of the American Bell Telephone Company. The authorized capital stock of the American Telephone & Telegraph Company is \$100,000,000. "Rights" may be traded in but not recorded."

pany is \$100,000,000. 'Rights' may be traded in but not recorded."

The following is a list of efficers and directors of the American Telephene & Telegraph Company: President, John E. Hudson; vice-president, Edward J. Hall; treasurer. Wm. B. Driver; secretary, Melville Egleston. Directors: Chas. & Amory, Melville Egleston, John E. Hudson, Alexander Cochrane, Edward J. Hall, Edward P. Meany, Joseph P. Davis, Henry S. Howe and Wm. D. Sargent.

John H. Davis & Co., Townsend. Whelen & Co., and E. H. Gay & Co., notify holders of Richmond Railway and Electric Company that the property has been acquired by the Richmond Passenger and Power Company, and that bonds are to be exchanged at par for a new issue of \$3,000,000 twenty-five year 5 per cent. bonds of the new road. A majority of holders have assented to the exchange. Copies of the bondholders' agreement may be obtailed at any of the effices mentioned.

The Philadelphia "Steckholder" says: "It is understood that in the not distant future application will be made to have securities of the Union Traction Cempany, of Chicago, listed on the Philadelphia Stock Exchange. Localcapital is to a large extent interested, and action of this character would, therefore, seem to be desirable. The stocks are very closely held by conservative investors in this city, who claim that the company has an exceptionally bright future before it."

A call has been sent out for a meeting of the stockholders of the New England

A call has been sent out for a meeting of the stockholders of the New England Street Railway Company in Jersey City May 14, to take action on a contract made recently between the directors and George A. Fernald & Co., disposing of the stock of the Winchester Avenue road of New Haven at \$49 a share. The proposition will also be made to reduce the capital stock of the New England Street Railway Company from \$5,000,000 to \$2,000,000, making possible the distribution of the proceeds of the sale as soon as delivery is made.

pany from \$5,000,000 to \$2,000,000, making possible the distribution of the proceeds of the sale as soon as delivery is made.

Receiver Grant, of the Third Avenue Railroad Company, has submitted by order of the court a statement of the company's earnings for March, showing: Total receipts, \$214,885: disbursements \$82,555; balance, \$132,330; interest and taxes, \$34,-247; surplus over charges, \$98,683. The duties of Mr. Grant as receiver will practically end May 19. On that date the sale of \$35,000,000 in bonds necessary to pay the road's debts will be voted. Mr. Grant expects to be relieved of his duties as receiver not later than June 1. The day the receiver was appointed, February 28, Third Avenue stock was quoted at 454. Yesterday it stood at 108½.

One of the largest mortgages ever recorded in the vicinity of Gloversville, N. Y., was that given recently by the directors of the Cayadutta Electric Railroad on its entire property of \$600,000 to the New York Security and Trust Company of New York as trustee, to secure an issue of consolidated 5 per cent bonds of the amount of the mortgage. Three hundred and fifty thousand of the amount is to be held by the trust company to retire the first mortgage 6 per cent. bonds which mature in 1902. The electric road is now operated by the Fonds, Johnstown and Gloversville Railroad. The remainder of the money will be used to pay present indebtedness and for future improvements. ness and for future improvements.

The committee appointed by the stock holders of the Welsbuch Commercial Company and the Welsbach Light Company to consider the changes which have taken place in the character of the Welsbach business since its separation into manu facturing and commercial companies has submitted its report. They suggest that a new company be organized with an authorized capital stock of \$3,500,000 and a large sinking fund and buy the shares of the Welsbach Light Company not owned by the Welsbach Commercial Company and the common and preferred shares of the Welsbach Commercial Company. The new corporation has been organized under the laws of New Jersey as the Welsbach Company.

under the laws of New Jersey as the Welsbach Company.

Articles of incorporation were recorded in Newark, N. J., on May 4, by the Edison Manufacturing Company, with a capital stock of \$500,000. It is divided into 5,000, shares, and \$1,000 has been paid in. The incorporators named are Howard W. Hayes, Edward H. Duryee and John E. Helm, of Newark. Its objects, as set forth in the papers, are to "manufacture and sell all kinds of machinery and mechanical and electrical appliances and to acquire the property, assets and good will of other companies, to acquire letters patent and patent rights in the United States and other countries, and generally to do everything connected with the business of manufacturing and selling all and every kind of machinery and apparatus." Its principal office will be in West Orange, N. J.

Vol. XVIII.

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No. 19.

# FLECTRICITY

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### EDITORIAL NOTES.

The Philippine Islands as a Possible Source of Our Copper Supply.

The Philippine Islands, while at the present time a cause of expense and no little trouble, prom-

ise to abundantly repay us in the future for all the present perplexities. They are known to be abundant in timber, mineral, agriculture and other resources, and not the least is the copper supply which may be derived from various localities on the Islands. Copper ores are said to occur in the following islands: Luzon, in the provinces of Lepanto, Benguet and Camarines; Mindoro, Capul, Masbate, the province of Antique in Panay, the province of Surigo in Mindanao. While it must be conceded that many of these resources may not be found to be profitable upon further investigation, while the great island of Mindanao is practically unexplored and is full of possibilities, and while the attempt at Masbate to work successfully the deposit which is known to exist there has not been what might have been desired, yet, on the other hand, the deposit in northern Luzon is valuable beyond any question of doubt. The best known portion of this region lies in the neighborhood of Mount Data, in latitude 16° 53', and longitude 120° 58' east of Greenwich. This peak is only one of a range of mountains trending due north to Cape Lacay-Lacay, and forms a boundary for all the provinces infringing upon it.

Data itself lies in the province of Lepanto, already mentioned, and in the range, of which it is one peak, copper ore has been smelted by the natives from time immemorial, and before the islands were discovered by Magellan. The process employed is a complicated one, based upon the same methods as those employed in the smelting of sulpho-salts of copper in Europe and America. It consists in alternate partial roasting and reduction to "matte" and eventually to black copper. It is generally believed that this process must have been introduced from either Japan or China. It is practiced at the present day by only one peculiar tribe of the natives, the Igorrotes, who are remarkable in many ways.

There are unauthenticated reports as to the routes by which copper comes to market that is smelted by the natives, which indicate that there are extensive copper mines in various portions of the Cordillera Central, but the only

deposits which have been examined with any care are those at Mancayan, about five miles to the west of Mount Data, and two or three localities within a few miles of Mancayan. The deposits at the latter place are described as being veins of rich ore, reaching seven meters in width and arranged in groups. Mean assays are said to show over 16 per cent. of copper, mainly as tetrahedrite and allied ores. The gangue is quartz, and the country rock is described as a large quartzite lens embedded in a great mass of trachyte.

\* \* \*

When a monarch dies the cry of "The king is dead, long live the king!" is

usually heard. In the business world of to-day an apt exclamation would be "Keeley is dead, long live Keeleyism!" for in spite of the numerous bubbles that have been inflated in the past, only to burst, and which should have served as a warning to that class of people who are reputed to be born every minute, every properly-advertised fake scheme has a host of applicants for stock or what-not, who dare rush in "where angels fear to tread."

The Rev. Jernegan's electrolytic scheme for extracting gold from sea water should have somewhat dampened people's interest in this particular line of investment, but such would seem not to be the case, for, according to the London "Daily Mail," patents have been taken out in England on a sea water gold extracting process, which is attracting considerable attention. As in the majority of schemes of this nature, the modus operandi is kept to a certain extent secret. A representative of the "Daily Mail" became acquainted, however, in some way with the "open sesame," and made a test of the process, the results of which are quite interesting. After referring to the fact that he was alone, and received no assistance in any way from those connected with the patent, he says:

"I could only experiment with a very small amount of water—a few gallons—and I did not therefore expect to get a vast quantity of gold. My idea was to prospect for a trace of gold, and then to refer to the ocean itself those anxious for larger quantities of the metal. I had been privately apprised of the nature of the particular substance which was to do the main work in wresting the gold from the water; and I had myself purchased, at a tradesman's, selected on the spur of the moment by myself, unknown to anybody else, a quantity

of this substance. I am not allowed to mention just what it is, but it is a thing in daily use by many people, and is to be purchased in quantities for a few pence or a few shillings, according to the amount desired. Having obtained my few gallons of sea water, I dropped therein the substance I had bought, which I was assured, would precipitate to the bottom of the water a muddy residuum technically known as 'sludge,' which sludge would contain such gold as the water contained."

Being unfamiliar with the process the experimenter dropped in, so he states, forty times too much of the "nameless" substance, which obliged him to carry away too much sludge, but in no way invalidated the experiment. He then continues:

"My three jars of sludge I took to an assayer; and in selecting my assayer I purposely avoided, n order to secure greater independence for my test, the assayers who had formerly assayed the sludge taken to them by the patentees, in which they had found 0.150 gr. of gold, equivalent to 9.729 milligrams from 50 gallons of water."

The assay of the sample of sludge obtained by the representative of the paper already referred to showed but 0.2 milligrams of gold. "Here, then," he says, "are the simple facts of the test. What the patentees, or a syndicate to be formed by them, intend to do is to purchase or rent land near the sea coast, and run sea water on to it at every tide. Precipitating the sludge at each tide, and then letting the water out, they propose to continue until such time as it might be deemed advisable to have a clean up, when the sludge would be dug up, and the gold separated in the ordinary way. The patentees calculate that the 'pay dirt' thus obtained would be rich enough to yield big dividends. Upon that point it is obviously too early to express an opinion. That it is an imaginative and picturesque scheme cannot be gainsaid; but the infinitesimal trace of gold revealed by this test does not seem to herald a day when a man may go into a 'bureau de change,' plank down a bucket of sea water, and receive a sovereign or two in exchange. Certainly much better assay reports have been yielded by former tests made by the patentees; but the desire of those patentees to permit a syndicate to share the marine gold with them suggests more benevolence than one often meets with nowadays,"

Possibly the Old Englanders are more conservative and hard-headed than the New Enganders proved themselves to be some two years ago, and that they will not nibble at the alluring gold bait held out to them, for the scheme just described should unquestionably be classed in the same category with the Keeley motor, liquefied air for power purposes, and various electrical curative devices.

The Testing of

An interesting series of tests were carried Third Rail Systems. on last month by the Boston Elevated Rail-

road Company in order to ascertain what system was best adapted for use on its new elevated lines. The trials, which extended through almost the whole of April, took place at night in the subway, where two of the tracks had been equipped with the third-rail. The competing concerns were the Sprague Electric Company, the General Electric Company, and the Westinghouse Manufacturing Company. The Sprague Electric Company exhibited its

multiple-unit system, which has given such excellent results on the South Side Elevated Railroad of Chicago for the past two years; the General Electric made use of a new master-controller system invented by Prof. Elihu Thomson, while the Westinghouse Company pinned its faith on an electro-pneumatic sys-

Mr. Sprague's multiple-unit system is now so well known that a description of it would be superfluous. The master-controller system of the General Electric Company is something new, and is described in the last issue of the "Street Railway Journal" as follows:

"The main controller proper of each car consists of a series of magnets or solenoids, each of which operates a contact with magnetic blow-out, accomplishing the same purpose as one of the usual contacts on ordinary handoperated controllers. There is one of the main controllers under the body of each car. On each platform of each car is a master controller of the usual form, but of smaller size. This master controller simply closes and opens the circuits of the solenoids or magnets of the main controllers."

In the Westinghouse electro-pneumatic system of control, the holding over of a handle of a multiple-control switch energizes a magnet which operates a compressed air cylinder valve, resulting in the controllers throughout a train being automatically advanced step by step, the acceleration depending on a make and break device located on the multiple-control switch.

In the trials at Boston the trains consisted of four cars, each of the latter being equipped with two motors of about 150 hp. each. The tests consisted of voltmeter readings, of ammeter readings to determine the amount of current going to the motors, and timing in the running. Besides these, instrument readings were made with one or more motors shut down and with couplings disconnected.

The trials proved most satisfactory in every way, all three systems showing up well. It is understood, however, that the directors of the Boston Elevated Railway Company rather lean towards the Sprague multiple-unit system, which would seem borne out by the fact that the executive committee of the Elevated Company has just placed an order with the Sprague Company for enough controllers to equip some sixty of its cars. This will involve an expenditure of but \$100,000, whereas the whole contract will entail an outlay of about \$1,000,000. The extensive trials in Boston, and the information as to the working of the various systems obtained through them, is very timely, in view of a large contract amounting to some \$2,000,000 about to be let for the equipping of the elevated roads in this city.

An interesting exhibition of the telegraphic machine invented by Prof. Henry A. Rowland of the Johns Hopkins University of Baltimore, Md., which was described in the issue of Elec-TRICITY of November 2, 1898, will be made at the Paris Exposition, and the officers of the American Commission have manifested much interest in it. Two good stations in the Electrical Building have been assigned to it at points distant from each other, so that visitors may see both ends of the line in operation. Dr. Thomas D. Penniman and Henry H. Wiegand, electrical engineers, both of Baltimore, have charge of the exhibit. It is probable that after the Exposition is over a long-distance demonstration will be made in Europe.

## UNDER THE SEARCHLIGHT.

#### Notes and Comments on Various Topics.

Wireless telegraphy is to be made use of in Westchester County in this State to connect Peekskill and Yorktown.

MR. JULIAN PFAN, of the graduating class of the Rensselaer Polytechnic Institute of Troy, N. Y., has been awarded the Charles McDonald prize, \$120, for the best thesis. His subject was "The Development of a Power Plant on the Hudson River."

THE United States section of the electricity exhibit at the Paris Exposition was recently damaged by a storm. Water poured through the leaky roof, ruining the decorations and carpets, and damaging the facade, which is one of the most attractive.

THE Electric Express Company is now carrying freight between the various cities and towns of Connecticut from Noroton and New Haven and between Bridgeport and Ansonia over the trolley lines connecting these points.

THE latest idea for the comfort of the public of the city of Quebec, Can., is an electric street sprinkler. It is stated that negotiations are being made with the Street Railway Company to run such a sprinkler over its lines in all parts of the city four times a day during the coming summer.

TO ENABLE tourists to cross the English Channel without the inconvenience of seasickness a Frenchman has designed a submarine boat to be propelled by cable traction. It will accommodate nearly 250 passengers, and will make the journey in about an hour, and should any accident happen to the motive power the boat may be detached and will at once rise to the surface and may continue the journey in the ordinary manner.

Workmen are engaged in placing an electric motor on the drawbridge at Beach Channel, L. I. The power will be transmitted to Beach Channel from the battery house of the Long Island Railroad at Hammel's station. During the summer months the bridges at Beach and Broad Channels must be opened very often each day so as to allow the large number of pleasure boats going to and coming from Far Rockaway to pass through.

HAVING obtained satisfactory results with the wireless telegraphy system developed by the Signal Corps, which has been operated in New York Harbor, Brigadier General Greely is said to be making arrangements to establish it at other points. It is understood he intends to equip San Francisco Harbor with the system and will also send sets of instruments to the Philippines and to Porto Rico. It is expected the system will be of great value in the Philippines in maintaining communication between garrisoned posts.

THE telephonograph, which is a modification of the phonograph, was recently inspected and tested by the German Postmaster-General and several engineers. Its inventor, Herr Paulsen, a Dane, has replaced the wax cylinder of the Edison phonograph by a steel band, and the style by a magnet energized by a telephone. Currents transmitted by the telephone pass through the electromagnet, and create conse-



quent poles on the steel band, and more or less the converse operation is employed for reproducing the sound. A long line can, of course, intervene between the transmitting telephone and the phonograph itself, and it is suggested that a telephone subscriber on leaving his office can set such a telephonograph to receive telephone messages during his absence. Even if the efficiency of the instrument is only twice that of the average office boy, comments the "Electrician," London, it should find many purchasers.

THE Government is considering the idea of constructing an electric weather signal system at Fairport Harbor, Ohio. A weather bureau is now established at the dock company's office, and the reports received are made known to the vessels in the harbor by means of flags. Government agents have made inquiries recently of the Commercial Electric Light Company at Painesville as to whether power for four 50 candle power white lights and two 50 candle power red lights could be furnished. If the idea is adopted a high iron tower will be built on the bluff by the dock company's office, and the weather signals will be flashed at night from the top. In this way vessels passing on Lake Erie may read the signals at night.

The utility of the electromagnet for removing pieces of iron and steel when in very awkward places was instanced in a German mine. A bore was being sunk, and at a depth of almost 1,000 feet, the hardened end of the steel bit broke off. This obstruction naturally prevented any further boring. In order to get the broken piece of steel out, therefore, a softiron bar 5 feet long and 2.7 inches in diameter was surrounded by a single winding of indiarubber-covered wire. It was then magnetized by means of a small dynamo and let down the When at the bottom, current was switched on through the wire turns, and in this way a fairly powerful magnet was obtained, which raised the steel to the surface without further trouble.

THE rapid completion of the Albany & Hudson Electric Road is attracting much attention, and railway experts from all over the Union are watching the progress of this vast undertaking. Nothing of the kind so extensive has ever been attempted before, and for the first time, apparently, people are beginning to realize the immensity and importance of the great electric road that is now nearing completion, which is to connect the three counties of Albany, Columbia and Rensselaer. Every effort is being made to get the road in operation by July 1, and for every day saved the contractors are awarded a substantial bonus. The third-rail system will be used throughout, and it is the only road of its especial kind known. It is claimed to be a combination of all the best known features of all roads now in operation.

SECRETARY GAGE and a number of officials and scientists, including Dr. McMurtrie, president of the American Association of Chemists: Dr. Kennelly, of the American Institute of Electrical Engineers; Capt. Sigsbee, chief of the Naval Bureau of Information, and Prof. Stratton, of Chicago University, were before the House Committee on Coinage Weights and Measures recently to advocate the establishment of a national standard bureau for the purpose of testing scientific and other instruments of precision. The committee voted

favorably on the measure, and agreed to offer it as an amendment to the sundry civil appropriation bill. The bureau will involve an expenditure of about \$200,000, and an annual outlay of \$35,000.

WILLIAM A. EDDY, the kite expert of Bayonne N. J., demonstrated by an experiment with 1,000 feet of steel wire last week that at a height of 600 feet electricity was drawn far in advance of the storm.

One of the direct results arising out of the Ottawa fire may be of a somewhat revolutionary character. It is in regard to the rebuilding of the mills and factories on the old sites and the manner in which they will be supplied with power to operate them. The mill structures and factory buildings at the Chaudiere Falls, which were destroyed, were most expensive to construct, being built over the water. The development of electricity has obviated the necessity which existed when the mills were erected of locating them in close proximity to the water-wheels which furnished the power. It is quite probable that the entire system of utilizing the magnificent waterpower available at the Chaudiere Falls may be applied to much better advantage than heretofore. A scheme is now on foot with the object of securing the amalgamation of most of the manufacturing interests at that point for the purpose of erecting a great power house where electrical energy can be generated and supplied to industries in the vicinity. The carbide establishments will use considerable of this electric power, and there will be sufficient to also provide energy, at a low enough figure, to secure the erection of new industries.

In the yards of the Atchison, Topeka & Santa Fé Railway, at Ft. Madison, Ia., the switches are lighted by electricity. The switch lamp is of the ordinary pattern, with an incandescent electric light of 8-candle power, fitting a socket inside. The wiring is brought to the switch stand in an underground pipe line, which is tapped by a branch pipe standing vertically 3 or 4 ft. clear of the stand and arching over so as to enter the top of the switch lamp. These lights, according to "The Railway and Engineering Review," are said to be entirely satisfactory, as the attention of a lamp tender is dispensed with and the electric light is safer against extinguishment than the common oil light.

A PRIZE of 1,200 marks (\$300) and a gold medal are offered to the designer of the best system of high-speed and heavy-traffic electric railways. The prize is known as the Veitmyer prize and will be awarded by a committee of the German Society of Mechanical Engineers. The conditions call for plans of a railway connecting two distant cities, upon which trains having a minimum seating capacity of 150 passengers may be operated at frequent intervals at a speed of not less than 200 kilometers (1244 miles) per hour. No intermediate stops are to be provided for. The principal engineering difficulties will be the questions of air resistance and terminal switching, as the electrical details are fairly well worked out already. The contest closes October 6, 1900.

The tenth dynamo in the central station of the Niagara Falls Power Company of this State was lately tested and found to be all right. This dynamo brings the station up to its intended capacity which is 50,000 horse-power. MR. M. W. CREAN, superintendent of the Yukon Government telegraphs, and S. B. Charleson, supervisor of Yukon Public Works, are inspecting the telegraph line which is being built northward from Quesnelle to Atlin, B. C., which, when completed, will give the Klondike region direct communication with Vancouver, B. C. Mr. Charleson states that he will have the gap between Quesnelle and Atlin spanned by November.

SWEDEN, of all the countries of Europe, is perhaps most blessed with natural power. From the mountain streams at the head of every fiord a quantity of energy is available, the total being enormous. To this fact the Swedes are rapidly waking up, and imports of electrical machinery for the utilization of these water powers are growing with rapid increments. Electric railways are under contract at Trolhaettan, Gothenburg, Lund, Bjerrod and Joenkoeping. The electric automobile is also achieving considerable popularity in Sweden and other Scandinavian countries, the benzine and gasoline varieties of motor carriages being considered too noisy and far to evil smelling fothose regions.

Advices from Paris state that a large quantity of American machinery has been sold to French buyers since the opening of the Exposition and there is not the slightest doubt that all exhibited will be sold before the close.

GEN. A. W. GREELY, Chief of the Signal Corps, has received a dispatch from Colonel Allen at Manila saying that the Signal Corps has succeeded in laying the cable line connecting the islands of Cebu and Leyte in the south ern part of the archipelago. Leyte is an island immediately south of Samar and north of Mindanao. Cebu is to the west of Lyete. Both islands are large producers of hemp. The Signal Corps has also completed the construction of a telegraph line northward from Manila to Aparri, on the extreme northern coast of Luzon. During Spanish occupancy of the Philippines this land line existed but was destroyed by the insurgents. Its reconstruction wil enable the garrison along the line from Manila to Aparri to keep in touch with both points.

The railway line between Murnau and Oberammergau has been opened, but owing to the bad weather the erection of the electrical equipment has been delayed, and the trains are at present being drawn steam locomotives. It is hoped, however, says the London "Electrician," that the electric installation will be ready before the Passion Play takes place. The line, which is being built by Messrs. Kummer, of Dresden, is 15 miles long, and has several gradients, the largest of which is 3 per cent., extending over a length of nearly four miles.

The aging of timber, which formerly required long storage, is now completed by electricity in a few hours. In the Nodon-Bretonneau process the timber is piled on a lead frame in a large wooden vat, is nearly immersed in a chemical preparation, and is covered over by shallow vessels of water having porous bottoms of felt and linen. The positive pole of a dynamo is connected to the lead frame and the negative pole to the water vessels. On the passage of the current, the sap is driven to one side of the wood and expelled, and the chemical liquid enters the pores and takes its place. After drying the wood is ready for use.



#### BY JEAN WETMORE.

The recent contract let for the equipment of an electric railway line between Detroit and Toledo, capable of maintaining a speed of sixty miles an hour, makes us pause to consider evils to come, and to call attention to the difficulties to be met in attaining so high a speed in an every day schedule.

Much has been said heretofore about the possibilities of high speeds to be obtained by electric cars, and electrical inventors have given many reasons for their faith in the final outcome, while prophecies have repeatedly been made for many years past of the final conversion of the present steam trunk railway lines into electric systems, capable of greater speed, more economy, freedom from dust, and excessive heat in summer, better heating in winter, and improved lighting during the whole year, and without special portable lighting installations. Attention has repeatedly been called to the fact that the circular unidirectional motion of an electric motor is more economical and practically free from vibration at high speeds when compared with a reciprocating steam locomotive. That it requires less complicated mechanism, cheaper construction, and less help at cheaper wages, to run an electric motor, and also if we place the motors under each car of a train, the greater the load, the greater the traction, with only comparatively slight additional weight to each car, is well understood.

Attention has been called to the fact that switch engines may be dispensed with, and that less help and machinery will be required in repair shops and roundhouses, giving a further saving in running expenses and in cost of equipment, and finally that the construction of large units of stationary power in generator stations, equipped with improved automatic stokers, triple expansion condensing steam engines will be far more economical than burning coal in a large number of movable furnaces, as in the present steam locomotive system.

All these advantages appeal to our judgment and chain our attention.

They are by no means new facts; our electrical engineers have been calling our attention to them for years, and yet no steam trunk lines have undergone a conversion to electric traction.

The elevated lines of Chicago have been pioneers in a limited way in a class of work where conditions were most favorable and they have shown encouraging practical results; the Brooklyn Elevated lines followed a good Western example, and have been giving almost as much employment to the Municipal Fire Department firemen as to motormen; the short Brooklyn Bridge line is apparently satisfactory, and a short New England road is said to operate successfully. All these equipments are of slow speeds compared with steam express work.

If good things come slowly, there must be valid reasons for the delay, and the progress of the Detroit and Toledo line as a pioneer in swift surface traction will be watched with interest. This line is of the overhead trolley type, and the first difficulty that naturally presents itself is the knife-like effect on the overhead network of span wires, when a car going at the rate of 60 miles an hour has a trolley wheel slip off the conductor. Unless well thought out provisions to meet this difficulty have been taken, such a result is likely to happen often.

A proper spring regulation at the base of the trolley pole must be provided or very long flashes detrimental to both the wire and the trolley wheel may be expected. As this road is nearly an air line between the two cities, the effect on the trolley wheel and arm in rounding curves at high speeds will probably not be determined. One of the first requirements of this line for successful operation will certainly be a very taut trolley wire, and strong taut spans and nothing save the best of accurate overhead construction, kept in constant good repair, will enable a schedule of 60 miles per hour to be successfully maintained. Speaking in a general way, high electric railway speeds will undoubtedly be better secured through the use of the third rail construction, rather than by the overhead system, as offering more substantial construction and greater freedom from repairs and deterioration. While in our opinion high speeds will necessitate this latter construction for the above mentioned reasons, which also eliminate the difficulties encountered in preserving good electric contact in the excessive swaying of the car at high speeds, or at least it will better enable safeguards to be employed; this difficulty will become less apparent near the trucks than at a distant point on or above the car roof or when electric contact is taken at some appreciable distance above the ground, as at the side of the ear body. My opinion is that the current supply should be taken midway from between the track rails for high speed traction, and that the contacts should be attached to the trucks, and not to the car body, for when attached to the former a more even contact pressure can be maintained to practically eliminate the uneven pressure due to swaving of the car and the action of the car springs, especially when running over uneven track and in rounding curves.

The trucks seldom leave the rails at high speed or inappreciably so, and the distance between the wheel axles and the roadbed is practically constant.

The third rail finds its best insulation on elevated electric roads, and here it can undoubtedly meet with success, but the constant leakage question, when the rail is laid on the ground or spiked to the ties, for long trunk lines will be expensive and we may say prohibitive. Successful insulation indicates no grade crossings and the elevation of the third rail on insulated supports even closely approaching the car axles. These general principles possess common sense and will undoubtedly be found correct in general practice.

The contact wheel, shoe or skate for high speeds is another element to be seriously considered; the contact shoe suspended from knuckle joints, operates successfully on the slow speed Brooklyn Bridge cars, but it would jump about in a reckless manner at a 60 mile an hour speed, while to keep it in close contact with the rail would necessitate considerable pressure, which would create great friction and a very great objectional cutting effect that would preclude durability. The wearing away would be greater than if a brake shoe was left set on a car wheel at a high speed. We would also have a great pyrotechnical display from the combined friction and imperfect electrical contacts at a high speed, which would be very apparent after dark.

A large contact surface may be secured by employing a shoe or skate, but at high speeds we meet with different conditions than are found in present practice.

A rolling contact is good, but it presents a

limited contact surface, which would require a large number of contact wheels to meet the requirements of the necessary heavy amperages to be carried, and a multiplicity of parts would be highly objectionable.

The high speeds require improved contact devices to meet the new conditions.

A very desirable device would be a rolling contact with a multiplicity of contact surfaces. but mathematically the ordinary trolley wheel gives scarcely more than a point which presents high resistance for heavy amperages. The trolley wire or third rail is tangent to the curved surface; if we could secure a wheel that would run flat on the wire or rail and present a multiple contact surface the problem would be solved. Obviously this is quite impossible with a solid trolley wheel, but quite possible with one possessing elasticity. Several years ago the writer invented and patented such a wheel, which secured a multiplicity of contacts with great radiating surface to dissipate the heat, but while it could not meet modern conditions, as then constructed, modifications to meet high speed requirements could possibly be made.

# THE EQUIPMENT OF THE ELECTRICAL ENGINEERS R. E. VOLUNTEER CORPS\*

We reproduce herewith a number of views illustrative of the apparatus taken out to South Africa by the Electrical Volunteers of England.

Burrell's special single-crank compound engines were the first two taken out: they were arranged to be of specially light build, weighing only eight and nine tons, whilst indicating 18 hp.

One of the special features of these engines was the arrangement of the two cylinders, one above the other, the two piston rods working on a single cross-head, to the center of which the connecting rod was attached.

The engines were capable of drawing loads of about 12 tons each, and it was found that they could travel on an average road for about six miles with the water carried on the engine.

For stationary work the water consumption worked out at about 32 lbs. per hour per ehp. developed, which is not a bad result to obtain from an engine of this type, though it was anticipated that after a little experience in handling the engines, the water consumption would go down to about 28 lbs. per hour.

The last engine shipped of the same make was arranged for partial condensation, with a view of further economizing the water.

To enable the engine to run for longer periods, one wagon was used exclusively for carrying additional water and fuel.

As regards the coal consumption, it was found that under ordinary conditions of working between six and eight cwt. of coal was consumed per eight hours a day.

It was found advisable to fit special spring arrangements to the front of the engines, to minimize the jolts transmitted to the dynamo—which was fixed on a bracket on the front of the engine, and was belt-driven off one of the engine pulleys.

The dynamos were of the multipolar semienclosed type, and were designed for 110 volts, 80 to 100 amperes, 750 revolutions per minute.

Finally, the engines, when completed, were entirely roofed over, and by means of water-proof covers dropped from the top they were completely covered in.

These have had to be specially designed,

<sup>\*</sup> From the "Electrical Review," London.



and with the exception of the barrel almost everything is novel. The gun-metal bases revolve in ball-run turn-tables, in the center of which a degree circle is fixed, with a movable pointer to facilitate synchronizing the projectors at a distance.

In this way, if a number of projectors were in position some distance apart, and it was necessary to move their beams simultaneously through the same angle, they would all receive they can be hauled along like an ordinary gun. A draw hook is fixed for pulling a second projector along, and when traveling the projector is usually attached to its limber in front.

A powerful serew brake is fitted which can be worked from the hindermost end when traveling.

Provision is made for attaching to the projector trail an ammeter, voltmeter, and main switch, the latter being normally fixed to the



FIG. 1.—PROJECTOR MOUNTED ON TRAIL, WITH LIMBER.

instructions to set their pointers to the same angle on the dial, so that one command by telephone would be correct for them all. The projectors are fitted on special steel trails, similar to gun-carriages, but fitted with springs. These trails are mounted on wheels from the Royal Arsenal, which ensures their being interchangeable with other wheels in the field.

The projectors may be detached from their carriages, and can then be used as stationary projectors on the ground, their four feet being each separately adjustable for height.

The mirrors, glasses, and divergers are mounted in aluminum; whilst the Coles reflectors are of deposited copper faced with silver, with a thin coat of palladium to prevent tarnishing.

It has been found necessary to entirely remodel the lamp mechanism, the pattern service lamp being far too heavy and clumsy; also, it was feared that the usual arc-striking arrangement would be hammered to pieces by the vibration of the moving carbon when the lamp is traveling about. The new lamp is arranged to lock the movable carbon holder in position, after the arc is struck, the feeding movement being carried out by the shunt coil acting on the other carbon.

As a drop of 52 volts can be allowed between the dynamo and the arc, the searchlights may be situated a mile or more away from each traction engine.

In working the projectors the elevating motion is actuated by means of a worm, and is consequently slow in operation; on the other hand, the horizontal motion, which has to be worked quickly for signaling purposes, is pulled round by hand.

Accuracy is naturally not of so great importance in the horizontal as in the vertical motions

The projectors on their trails can be drawn either by traction engines, mules, or by hand, and for this latter purpose drag hooks have been arranged on the end of the axle, so that

trail. Preparation has, however, been made for fixing them at either end, the ammeter and voltmeter being suspended, whilst holes have been drilled for attaching the main switch.

Fig. 1 shows very clearly the projector mounted on its trail. The instruments are also shown hung in position, whilst in the

ropes. Behind, a flap door was fitted, by lowering which the inside of the box, thoroughly lined with felt, was exposed. The inside of this box was fitted up with shelves, and arranged to carry two projector lamps, two mounted mirrors, one plane glass and one di-

A box was further fitted underneath the seat, access to which could be obtained by lifting the seat, and in which carbons, tools, drag ropes, ammeter and voltmeter were kept.

The driver's seat was arranged to accommodate two persons, and from it a screw brake could be brought into operation.

On the roof itself a variable resistance in its own box was carried, and this resistance could be worked either in this position or it could be taken down and used on the ground.

In passing, attention might be drawn to the extremely suitable design of a resistance of this description for rough work. It consisted of short lengths of solid wire fixed rigidly between asbestos clamps, thus running little risk of short circuiting when the wire became heated and expanded—a trouble frequently met with when coils of wire are used.

#### PORTABLE CABLE DRUMS.

The cable carriages were arranged to carry three drums on each, the center drum being somewhat larger than the other two.

About 200 yards of cable could be carried on each drum, the cable being capable of transmitting about 100 amperes. It was chiefly concentric, with the outer conductor bare, and braided to prevent its unwinding should one section become damaged.

All fittings, such as ammeter, switch, etc., contrary to the usual practice, would be arringed on the outer or earthed wire, which would enable one to do any coupling up without fear of shock.

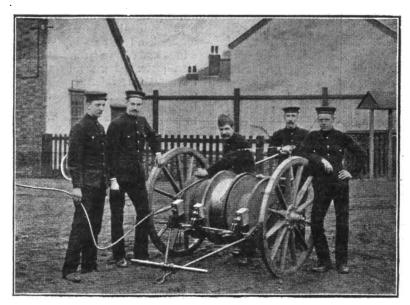


Fig. 2.—Portable Cable Drum.

center is Captain Lloyd, R.E., with his hand on the main switch.

On the right hand side is shown the limber, and on the top the adjustable resistance.

#### LIMBERS.

The limbers consisted of wooden boxes lined with steel, whilst the underframes were built up of angle iron.

They were mounted on springs, the axles and wheels being made interchangeable with those of the projector carriage. They were arranged for draught with mules or traction engine, by using a pole, or for being pulled by hand with

Each drum was prevented from turning at will by means of a brake, whilst the cable was wound up by hand after use.

The wheels and axles were here again interchangeable with those used for the projectors.

The drums could be pulled in either direction, either by means of a traction engine or by hand; when drawn by hand ash handles could be fitted in.

In Fig. 2 is shown the portable cable drum, with an ash handle in position, ready for being bauled by hand.

To facilitate communication 20 cycles bay



been taken out, some with eight inch, others with nine inch cranks. Six of these cycles were fitted with spindles over the back wheel, to which were attached two light cable drums, each holding nearly two miles of fine bare copper wire.

A cyclist can pay this wire out while riding along as fast as he can go, say from eight to fifteen miles per hour.

Small brakes without much friction were fitted on these drums to keep the wire from over-running.

The wire was bare, whilst the earth was used as the return circuit, and it was found that even on wet ground one could telephone up to three or four miles with the wire trodden in the ground, and even broken.

To pick up the wire a handle was attached to the drum, and the cyclist wheeled the bicycle forward with one hand, and wound with his field telephone. The drums mounted over the back wheel of the cycle are clearly seen, and from this picture it will be easily understood how simple it is to lay the telephone wires.

# POOR INCANDESCENT LIGHTING-ITS CHIEF CAUSE AND REMEDY.

BY H. L. MONROE.

There is without doubt great opportunity for improvement in the character of incandescent lighting service given by central stations in the Southwest. Central stations have too long neglected to consider the essentials necessary to a good lighting result. They provide good station apparatus and machinery and competent supervision for the correct operation of the same. They provide proper distributing service, including lines and transformer. When, however, they have made con.



Fig. 3.—Sapper Using Field Telephone; Bicycle Fitted with Cable Drums for Laying Telephone Wire.

the other, the wire being led over a guide on the handle bar, and thence to the drum. It was found that the wire could be picked up in this way as fast as the cyclist could walk, say four miles per hour.

In the event of the wire being badly damaged it would be left on the ground, as, being light, any quantity of spare could be carried.

The telephones themselves were carried on the back of the cyclist, and were of the Swedish cavalry pattern; they could either be used for speaking purposes or the signal might consist of the "buzzer" being used on a high resistance or leaky surface.

These instruments are fitted with a third terminal through a condenser, which enables one to tap an enemy's wire, and hear all that is going on by just laying a wire from this third terminal across the telephone wire, and without in any way interrupting the conversation.

In the same way a commanding officer can listen to any instructions being given by his subordinates.

v. In Fig 3 is seen a sapper in the act of using

nection, with the customer's premises and installed a meter they seem to think their duty is ended. They neglect to consider one essential feature for which the whole lighting plant is operated to supply current, namely, the incandescent lamp. This most important and essential device is turned over to the customer for him to purchase and use as he pleases.

The central station takes good care to provide all necessary apparatus to generate current, but the device that utilizes this current, to produce the substance the station is making and selling—i.e., light—the lamp is entirely ignored and left to the mercies of the public. I desire to point out that this is a mistake.

It should be just as much the part of a lighting company's business to supply a good efficient lamp and renew it when dim as it is to supply current to light the lamp. How can any central station expect to secure good lighting results when the one device which makes the light is not under their control and charge.

You might as well expect to secure good results by putting an inefficient propeller on the shaft of a modern steamship fully equipped with most complete machinery, or to expect an effective service from our modern men-of-war by equipping them with indifferent guns after all other details of construction had been supplied in a most complete and expensive manner. I desire to repeat again that what central stations are making and selling is light. They may supply it by ampere hour, watt hour, lamp hour, or by contract, but what the customer is using and paying for is light. If, therefore, a station has all other essentials and has the most perfect construction and operation, if it fails to give a good service of light it defeats its own object. It is an axiom that none can dispute, that without good lamps properly renewed a good service of light is impossible. So then we see that the lamp, far from being a device that can be ignored and turned over to the customer, is a device that the station should own and control and carefully look after.

The great evil of electric lighting-poor service-is the result of the practice followed by numbers of stations in this section, of charging their customers for their lamps. This practice has arisen as a parallel from gas practice. Because, for example, the gas companies made customers buy their fixtures and burners and tips, the electric light companies concluded that they would charge customers for the lamps. The error of such a conclusion is evident when we consider the difference between the two cases. When the practice was adopted in gas lighting the old tip burner was the only kind used. These burners were mechanical and as long as they were not fouled they gave practically the same results. The quality of light in gas service, therefore, did not depend upon these burners, but on the quality of gas supplied; that is, the gas companies improved their lighting by improving the quality of their gas by work at their central station. It made little difference, therefore, whether the customer or gas company supplied the tip burners, they were practically all the same, and gave the same results throughout life. Mark the difference in electric lighting. Here the results are not dependent upon the service at the station. Barring the matter of regulation, a company cannot do one thing more or less to improve the quality of the light by any work at the station. We can have the same electrolier taking same current from same station dynamo and transformer, and will get totally different results in lighting, according to the type of lamp we install thereon. We see, therefore, that in electric lighting the quality of light is dependent solely upon the burner; that is, the lamp, directly the reverse of gas lighting, so that what is an indifferent detail in gas lighting becomes a very important feature in electric lighting, namely, the control and regulation of the burner or lamp. I may say, parenthetically, that this same point is now coming home to gas companies, with the introduction of the Welsbach burner. Here is a burner similar to the incandescent lamp, on which the result in light depends. We have examples everywhere of the miserable results in lighting service consequent upon the attempt to leave these burners in the hands of the consumer, who never renews them until they absolutely burn out.

Return now to the incandescent lamp. We have seen the error of the practice generally followed in this section. The only effective



<sup>\*</sup> A paper read at the annual meeting of the Southwestern Gas, Electric and Street Railway Association, Waco, Texas, April 13, 1900,

way to overcome the condition is to supply. free lamp renewals. This is possible for every central station with their meter customers, and as it is generally the desire of all stations to adopt meters, this change to free renewals should go hand in hand with the change of charging service to the meter basis. As long as a customer is charged for his lamps. two conditions will prevail. If the lamps are not sold cheap enough by central stations, many customers will buy any other lamp which they can get cheaper. The only features by which an average customer can select a lamp are cheapness and long life, two features which invariably secure them the poorest type of lamp.

If central stations are to charge for lamps, then the price should be made so low that customers would have no inducement to buy elsewhere than from the station. If this is not done, the circuits are bound to be loaded with lamps of various types and shapes, varying candle powers and varying wattages. The lighting service will be mixed, low candle power contrasting with the high candle power, to the great dissatisfaction of the customers and prejudice of good lighting service. Meter bills will be uncertain and high as a result of varving wattages of lamps, and complaints will be frequent and allowances unavoidable. In this day, Lowever, when so many cheap lamps are flooding the n.arket, and the repaired product of certain lamp manufacturers is sold as low as 10 cents, it will be seen that central stations will have to reduce the price of lamps very low in order to control the supply. It would be a much better plan for the central station to cut the "Gordian knot" at once by supplying lamp renewals free of charge, and place the lamp in the same category as the transformer, a piece of apparatus owned and controlled by the central stations.

As long as a customer is charged for a lamp. even though it be but five cents, he will continue to use it until it is black in the face, dim and useless. The central station will be powerless to overcome such a condition, and the results of the best operated station will be nullified by old and dim lamps retained too long in service. It has been tried in numberless cases to urge customers to renew their lamps. by circulars, postals, and inducements of every kind, but to no avail. The amount of money and time wasted in such attempts is much better spent in the direct and effective method of free renewals. The condition is simply this: The quality of incandescent lighting service depends directly upon the lamp. All lamps deteriorate after a certain number of hours' service and some makes in a greater degree than others. If lamps are not renewed, therefore, the lighting service is bound to deteriorate in the same degree as the lamp. Repeated experience has shown that customers will never renew their lamps when charged for them, except when they are burned out. It therefore follows positively that as long as lamps are sold to the customer the deterioration in lighting service cannot be properly repaired. An old proverb says, "It is necessary to break eggs to have an omelet." It is equally true that in lighting service, you must break lamps to have good light. A given number of kilowatt hours' service requires a fixed number of lamps to be used, taken out and broken up. If any less number is used the lighting service has deteriorated correspondingly. We all remember the story of the man who boasted that he had gotten his horse down to eating but three oats a day, when the animal died. A parallel is found with electric lighting companies that endeavor to shift the responsibility on to the customer, and cut down the number of lamps used to practically nothing. If the service is not properly fed with new lamps it is sure to languish and suffer. The only objection to be urged against the free renewal policy is the expense of it. The question is asked "Can a station afford the expense?" That I can answer most positively "yes," for all meter customers. The real question is not whether central stations can afford this policy, but whether they can afford to do without it. In these days of Welsbach burner competition, and the Kitson, and other new forms of oil lamps, with Welsbach burners, electric lighting companies certainly need to take some steps toward an effective improvement in their lighting. The lamp costs but a small fraction of the cost of the current to light it. The other expenses are from ten to twelve times the cost of the lamp. It is certainly foolish to attempt to save on the one-tenth which the lamp costs, and thereby destroy the value of the remaining nine-tenths. How much better to expend the one-tenth by free renewals, and thereby secure the full value of the remaining nine-tenths. The actual cost of free renewals will average about one-half to two-thirds cent per kilowatt hour, and if stations wish to be reimbursed, they can increase their meter rates accordingly, or adopt free renewals in place of any reductions in rates. There ought to be little difficulty in central stations obtaining slightly increased rates for the great improvement of service which the free renewals will secure. Aside from this, however, central stations can afford the step, whether they are to be reimbursed for it or not. In the first place, if free renewals make it possible to improve the lighting service fully 50 per cent., certainly two-thirds cent per kilowatt hour is a small price to pay for the improvement. Such advancement means increased business, customers better satisfied, absence of complaints and allowances, and maintenance of better rates. No such slight expense should be spared which will make electric lighting so good that no one needing light can very well afford to be without it. I wish to urge upon central station management the importance of having an incandescent lamp department, which will be responsible for the superintendence of lamps and conditions of lighting service. Adopting free renewals, the central stations should make it their business to look after the lamps and conditions of lighting service. Experience has shown that they cannot depend upon the customer to renew them properly even when they are furnished free. Besides, attention to this detail pleases the customer, and electric lighting is bound to be more popular when all a customer is required to do is to pay his bill and turn his switch, and the lighting results are always ready, and invariably good without any further trouble on his part.

The best methods of looking after lamps are as follows:

1. Periodically remove all lamps from the circuits one to four times per year, according to the conditions, and replace them with new ones. Photometer the lamps removed, and save those measuring above a prescribed limit (say 13 cp.) for use at high voltage points, or locations where reduced candle power is of slight importance. Scrap the remaining lamps.

2. Give a new lamp in exchange for an old one for, say, every \$3 worth of current supplied, or for any fixed amount determined by the meter rates and conditions.

The second plan is an excellent one, in that it offers a bonus for the use of current and regulates renewals on the correct basis of number of hours of lamp service. It can be profitably adopted wherever meters are in use. A station attendant should visit customers quarterly, and install the number of new lamps due each, removing and returning to the station an equal number of old lamps. If station attendance is limited, a lighting company can fill out, and mail to their customers, each quarter of the year, blanks similar to the fol-

Due to Mr. .... .....16 candle-power lamps, for the quarter year ending ...... which is on the basis of one lamp for every \$3 worth of current supplied.

Present this slip at the station or office.

\*\*\*\*\*\* \*\*\*\* \*\*\*\*\*\*\*\*\*\* Summing it up, therefore, we find that to have good lighting service, it is necessary (1) that incandescent lamps be supplied by central stations free of charge to the customer, and (2) that these lamps be periodically renewed so as to weed out the dim lamps, and keep the service bright. That such a system pays most handsomely has been found to be the experience of every central station adopting it. It is the practice of the leading stations to-day, and it has done more than anything else to successfully build up the lighting business of the United States. The opposite policy is responsible for the very poor and miserable lighting service to be found abroad on the Continent of Europe. Nothing is more important, vital and essential to the well-being and success of all electric lighting. One of the leading officials of the United Gas Improvement Company at Philadelphia recently instructed one of the largest properties using over 100,-000 lamps a year, to furnish lamp renewals free, and gave it as his opinion that only by free renewals can an electric lighting service be properly maintained. Experience has given most positive evidence on this point. Free renewals is the policy of the leading electric stations, and station after station in the East and South are gradually coming to this liberal policy, by which they can control directly their own lighting results, instead of permitting the customer to buy the lamp, and thereby balk all efforts of the station to secure good lighting.

Now, gentlemen, here is the condition confronting you-it is not a theory. The incandescent lighting service of every station in this section is capable of much improvement. It does not answer the question nor solve the difficulty to put the blame on the customer, because he does not renew his lamp. He does not and cannot understand the essentials of a lamp, and invariably blames the company for his poor results. You only pile up trouble and poor returns for yourself by endeavoring to make the customer, from whom you derive your income, responsible for the character of your service. Some other standard than "a customer's kick" should prevail. I earnestly recommend the early adoption of free lamp renewals by all stations with their meter customers. It improves lighting results more promptly and directly than any other department of central station service. It assists the stations to increase their business, and hold their old customers in a way nothing else can. It is a wise and profitable policy, and one that



all lighting companies should follow. With your contract customers, sell lamps, if you will, but sell at a low price, low enough to induce the customer to buy all his lamps at the station, and thus exclude the cheap and worthless lamps.

With your meter customers, however, adopt free lamp renewals, and be able to control and regulate your lighting results, and make electric lighting so good that no one can afford to do without it.

# Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended May 12:

Antwerp, 37 packages, \$3,688; Australia, 598 cases, \$61,989; Barcelona, 7 cases, \$239; Brazil, 332 packages, \$13,704; British East Indies, 9 cases, \$460; British West Indies, 16 packages, \$1,829; Central America, 18 cases, \$230; China, 39 cases, \$4,167; Cuba, 11 cases, \$489; French Possessions in Africa, 6 packages, \$289; Havre, 194 packages, \$10,226; Hong Kong, 45 packages, \$3,000; Hull, 6 packages, \$450; Japan, 3 packages, \$65; Liverpool, 212 packages, \$28,824; London, 21 packages, \$1,749; Marseilles, 50 packages, \$300; Mexico, 167 packages, \$3,775; Newfoundland, 4 cases, \$33; New Zealand, 3 cases, \$105; Nova Scotia, 3 cases, \$60; Peru, 36 packages, \$2,377; Porto Rico, 4 packages, \$980; Southampton, 88 cases, \$3,737; St. Petersburg, 8 packages, \$250; Tasmania, 5 cases, \$400; U. S. Colombia, 4 cases, \$373; Venezuela, 50 packages, \$919.

## Fine Showing of Strength.

The forty-ninth annual statement of the Phœnix Mutual Life Insurance Company of Hartford, Conn., like all the statements of the company for years past, is gratifying to the managers and policy-holders. It shows assets, at conservative valuation, amounting to \$12,-259,291 and a surplus of \$540,276, beside a special reserve fund of nearly \$150,000, which is also practically surplus. The strength of the Phœnix Mutual is well established and universally recognized, and its investments are of the highest class. They have increased about \$600,-000 during the year, mostly in loans on first mortgages of real estate. The real estate owned by the company is somewhat less than a year ago, which means that it has sold more than it has taken in. The company's new building in Hartford is one of the features of the city. It was put up before the recent rise in building material, but has all the latest inventions and improvements of modern construction and is a model of convenience and attractiveness.

A few suggestive figures of growth are given in the statement. In the past three years the policies in force have increased from 28,269 to 35,512, and the insurance in force from \$46,021,069 to \$57,985,510. The new insurance last year was \$15,547,421. Since its organization the company has paid its policy-holders more than \$40,000,000. In recent years it has come forward into a prominent position among the life companies of the country and is known for its financial strength and the energy and success of its wide-awake management.

## Proposals Invited.

The Bureau of Supplies and Accounts of the Navy Department is inviting sealed proposals until May 22 for furnishing the Mare Island, Cal., Navy Yard with one generating set.

#### ENGLISH ELECTRIC SHUNTING LOCO-MOTIVES.

#### BY FRANK C. PERKINS.

What is known in American railway practice as an electric locomotive for switching freight cars, and in steam railway work is termed a switch engine, is called on English railways a "shunting" locomotive.

An electric shunting locomotive, of the type

ary power plant, there is probably no method of obtaining motive power more conveniently and economically than by the addition of an electric generator, and the construction of an overhead trolley system. The electric generator which was installed in this plant was of the Manchester type, and designed for 100 volts and 54 amperes at 1,100 revolutions per minute, and is driven off the main shafting in the works. The current is conveyed from the

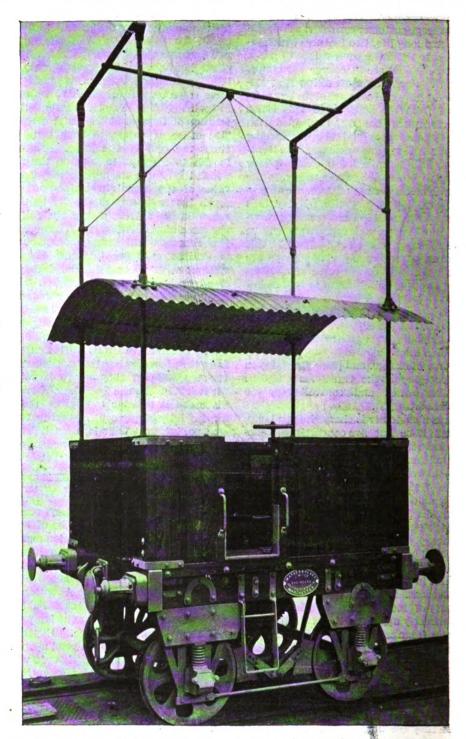


FIG 1.—ELECTRIC SHUNTING LOCOMOTIVE USED AT ENGLISH TEXTILE PLANT.

shown in Fig. 1, has recently been placed in service at the textile machinery works of Tweedales & Smalley at Castleton, and has been giving excellent satisfaction. It is used for switching cars on the siding connecting the boiler house and delivery stores of the textile machinery works with the main line. Although the service is light, it is hardly necessary to point out that, were it required, a locomotive of much greater capacity could be provided; and wherever locomotive power is needed at private works possessing a station-

generator in the usual minner to the overhead wires, and returns through the rails, which are bonded with copper strips and rivets. The locomotive shown in the intustration was constructed by Messrs. Mather & Platt, Limited, of the Salford Iron Works, and somewhat resembles the ordinary goods wagon used in the English works. The driving motor is also of the Manchester type. It is mounted on a cast-iron bed plate, which slides on cast-iron brackets bolted to the frame of the car. A vulcanized fiber pinion is used having 21 teeth

and having on the ends steel end plates. This pinion gears with a cut cast-iron wheel of 72 teeth on the gudgeon shaft, on which is keyed a chain pinion of 7 teeth, driving a chain wheel of 22 teeth. The latter is split into two halves, and is fitted to one axle of the locomotive. The car has coil spring buffers, also axle boxes and guides, and a hand screw brake with brake blocks of wood bearing on the 28" wheels. Wrought iron pillars extend through the corrugated iron roof, and carry the col-

tinually kept fired up, while the generator can easily be started by throwing the power on the machine from the main shafting. The same generator is used for operating the threeton electric crane, usually in operation, and hence the locomotive may be used at any time.

The electric shunting locomotive, shown in Fig. 2, was built by the same firm for a large iron works in Sweden, and is designed to draw a load of nearly 100 tons at a maximum speed of four and one-half miles per hour. The

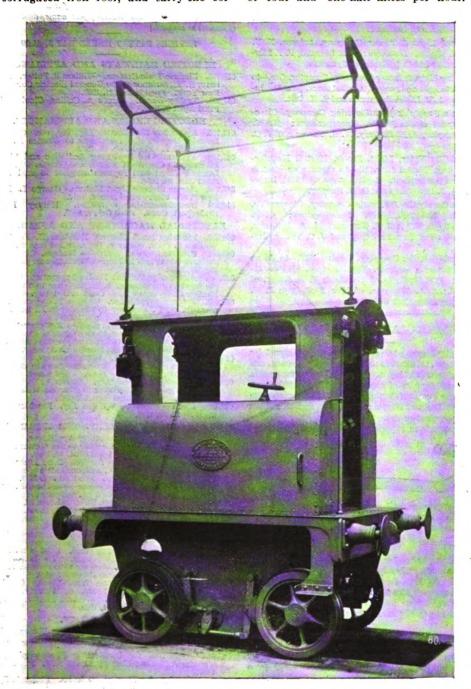


Fig. 2.—English Electric Shunting Locomotive Used at Swedish Iron Works.

lector bars. This locomotive weighs about three tons and the controlling mechanism consists of a main switch and a rheostat for starting and regulating the speed, and also a reversing switch.

The system of collecting the current on this line is peculiar, and consists of two wroughtiron bars located about 6 feet apart, one of which is always rubbing on the under surface of the trolley wire. This system is also used on a more extended scale on the Douglass and Laxey Electric Tramway. As this locomotive is used usually only two or three hours per day it is said to effect a considerable saving over a steam locomotive, which would have to be con-

voltage in this line is 300 to 330 volts. The side frames of this locomotive are steel, and the wheels are 27" in diameter with a wheel basis of 4'6" long. The design of the cab is similar to those made by the same firm for the City and South London Railway. The motor used on this locomotive is of the double armature type made under the patents of Drs. J. & E. Hopkinson. The armatures are connected to the axles by means of spur gear, ten to one. As will be noticed in the illustrations the overhead collecting gear is similar to that of the locomotive previously described, except that the height is in this case about 16 feet from the ground. All of the working parts and the

controlling mechanism are boxed in on account of the heavy falls of snow experienced in the winter season in Sweden.

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#### **ELECTRICAL CONDUCTORS AND DIRT.\***

#### BY A. A. CAMPBELL SWINTON.

Everyone must have noticed how electrical wires and fittings gather dust. Hot-water pipes have a similar tendency, and for a long time I was of the opinion that the action was similar in both cases, and was due to air currents produced by heat. Recently, however, I have had reason to alter my views, and the matter appears to be of sufficient interest for detailed description.

In a new office I have now occupied for five months there are in my room five plain pendant fittings. As the ceiling is of concrete, and as it was necessary not to disturb the tenant above, these pendants all consist of plain flexible cords of the usual twisted pattern, which start from ceiling roses on the wall near the cornice, and are led through insulated eyes across the ceiling to the points from which they hang. The supply is the continuous-current supply of the Westminster Company at 200 volts. Three of the pendants are upon one switch, the other two being upon another switch. Of the set of three, two are of 16 cp, one of 32 cp. I mention this latter fact, though it has nothing to do with the phenomenon observed. All the lights in practice are used at once, so that in this respect the conditions are the same in each case. The following, however, are the results, which are sufficiently remarkable to deserve notice.

Within a week or two of my entering into occupation of the office and using the lights it was observed that, whereas the three flexible cords connected with one switch remained clean, the two cords on the other switch were rapidly accumulating dust. The latter were repeatedly dusted, but the effect always repeated itself. At present, after some five months' use, while the one set of three cords is still comparatively clean, never having teen dusted, the other set of two cords is thickly covered with an aggregate of dust particles, which in some places project fully one quarter of an inch from the cord. Further, while the plaster of the ceiling in the case of the set of three cords is absolutely white, and the ceiling roses at the ends of these cords retain their original color, the ceiling immediately above the set of two cords is blackened with a well-defined broad dark line, while the ceiling roses that serve these two cords are also covered all over with a dark deposit.

Now for the reason of this strange phenomenon. It is very simple. In the case of the set of three pendants the flexible cords and ceiling roses of which do not become dirty, the switch is in the positive pole. In the case of the other set of pendants, whose cords and roses become covered with dust, and which even blacken the ceiling with which they are not in contact, the switch is in the negative pole. Now, as is well known, the negative conductor in the street mains has a tendency to earth itself to an extent which is sufficient to cause the negative lead to be almost always at the same potential as earth. Consequently, the positive conductor is always at nearly 200 volts potential above that of earth, and therefore above that of the dust particles present in the atmosphere. This point has been tested in my office with a volt-

<sup>\*</sup> From the "Electrician," London.



meter, with the results that from the negative there are only about 30 volts to earth, while from the positive there are 170 volts to earth. The reason for the effects observed is thus obvious. In the case of the three pendants, whose switch is in the positive, it is only when the switch is turned on a few hours per diem out of the 24 that there is any appreciable difference of potential between the cord and the surroundings. Even then it is only one conductor in the cord that has this potential, and the exterior of the covering very possibly always retains zero potential. In the case of the other set of two lamps, whose switch is in the negative, the result is far different. When the switch of this set is turned on, no doubt the conditions are similar to the other set when the latter's switch is also turned on. But during the many hours every day when the switch is turned off, in the case of the two-light set both of the conductors remain constantly at a potential 170 volts above that of its vicinity The dust is therefore caused to deposit upon the cord and upon the ceiling rose by electrostatic attraction. No doubt the use of 200 volts. which will give four times the attraction afforded by 100 volts, has made the effect more marked in this particular case.

I should not have thought it worth while bringing the above facts forward publicly had they not been so marked as to be a serious nuisance in the case of the pendants whose switch is in the negative. From the point of view of the wiring of decorated rooms in a town with an atmosphere like London the matter is of very considerable importance. It will be found that with the switches in the negative, an amount of dirt will be deposited in a few weeks that would take years to accumulate with the switch in the positive. I am well aware that from a totally different point of view, in damp situations, there is an advantage in putting the switch in the negative, for the reason that otherwise the metallic mechanism of the switch is liable to be corroded away by electrolytic action. In dry places, however, where it is desired to keep electrical wires and fittings clean, I have no doubt that in an atmosphere such as we have in this great city, switches should always be placed in the positive conductor, so that the exteriors of such fittings and wires should remain as far as possible at earth potential.

#### LEGAL NOTES.

A complaint has been entered in the United States Circuit Court in which the Electric Cable Construction and Maintenance Company of Philadelphia, Pa., charges the National Conduit & Cable Co., of this city, with an infringement on a patented improvement in leadcovered electrical conductors, the patent being owned by the complainant company. The complainant asks for an accounting and payment of the moneys accruing from the alleged infringement, and for a perpetual injunction against the defendant.

#### PERSONAL MENTION.

Mr. Timothy L. Bosart, vice-president of the Jenney Electric Manufacturing Company of Indianapolis, Ind., recently died of heart disease.

Mr. H. A. Carriveau of Montreal, who is extensively interested in electrical improvements in Canada, has been in this city for some days negotiating, it is stated, with large el etrical corporations for the establishment of several new lines of electric transportation in various parts of Canada.

Mr. G. F. Sever was recently appointed superintendent of electrical exhibits at the Pan-American Exposition to be held next year at Buffalo, N. Y.

#### INCORPORATIONS.

The Citizens' Light. Heat & Power Company, Waterloo, Ia. Capital stock, \$100,000.

The Osborne Electric Railway Equipment Manufacturing Company, Auburn, N. Y. Capital stock, \$250,000.

The Winnebago Traction Company, Oshkosh, Wis. Capital stock, \$650,000. Incorporators: H. I. Weed, George W. Athearn and M. H. Eaton.

The Varney Electrical Supply Company, Indianapolis, Ind. Capital stock, \$30,000. Directors: Gordon E. Varney, Arthur V. Brown and Charles O. Britton.

The Zenith Electric Light Company, Chicago, Ill. Capital C. W. Buckley, Lewis J. stock, \$15,000. Incorporators: Osborn and William G. Husband.

The Citizens' Light & Power Company, Auburn, N. Y. Capital stock, \$30,000. Directors: G. B. Leonard, F. T. Pierson, T. H. Mather and C. D. Beebe, of Syracuse.

The Sumpter Light & Power Company, Sumpter, Ore.-to furnish electric light and power. Capital stock, \$50,000. Incorporators: A. C. Little, E. Cannon and S. H. Belt.

The Electric Supply & Manufacturing Company, Cleve land, O. Capital stock, \$50,000. Incorporators: H. W. Jones, C. H. Taylor, F. R. DuGuay, W. H. Turner and F. C. Hofemiester.

The Mound City Water, Light, Power, Heat & Manufacturing Company, Mound City, Ill.-to operate an electric light, heat and power plant. Capital stock, \$60,000, Incorporators: A. J. Dougherty and O. M. Murphy.

The Fulton County Gas & Electric Company, Gloversville, N. Y. Capital stock, \$1,500,000. Incorporators: G. E. Spencer, Brooklyn, N. Y.; J. B. Summerfield, A. Mathews, H. C. Everdell, all of New York City, and J. C. Young, Jer-

The Machado & Roller Company, Esopus, N.Y.-to do an electrical engineering business. Capital stock, \$10,000. Incorporators: J. E. Machado, of Plainfield; F. W. Roller. of Roselle, N. J.; A. A. Whilman, of New York City; F. W. Yates, attorney, New York City.

#### COMMERCIAL PARAGRAPH.

The Donnelly Improved Steel Climbers, manufactured by J. J. Reidy & Co., 311-315 East street, New Haven, Conn., are not an experiment, as they have been tested for two years by experienced linemen of the Western Union Telegraph Company, the Postal Telegraph Cable Company and the Southern New England Telephone Company, and have been adopted by these companies,

They are made from a special steel that is manufactured



solely for that purpose, and possess great strength without unnecessrry weight, making them easier and safer to climb with than the old style, as the following testimonials will at-

New York, April 6, 1899.

About five months ago I secured a pair of your Improved Donnelly Climbers. They have been in constant use ever since by Lineman J. Keefe, who states that they are safer and more easy to climb with than any climber he has everused. A number of our men are now using your climbers, and all speak highly of them. Yours truly,

T. J. JENNINGS. Foreman of Construction Postal Telegraph Cable Co.

New Haven, May 5, 1899.

The J. Donnelly New Improved Climbers are in use by nearly all of the linemen employed by this company. I can cheerfully recommend them for strength and durability

J. W. LADD.

Supt. Construction The Southern New England Telephone Co. The following are a few of the well-known firms who buy Donnelly's Improved Steel Climbers: Western Union Telegraph Co., Postal Telegraph & Cable Co., J. H. Bunnell & Co., The J. Jones & Son Co., Manhattan Electrical Supply Co., Morris Electric Co., Patterson Bros., Stanley & Patter son, Western Electric Co., of New York City: New York & Pennsylvania Telegraph & Telephone Co., Elmira, N. Y.; Roe & Conover, Newark, N. J.; National Electric Supply Co., Washington, D. C.; James McGraw, Tower Binford Electrical Co., Watkins-Cottrell Co., Richmond, Va.; Edward Lovell's Sons, Savannah, Ga.; A. Baldwin & Co., New Orleans La.; Electric Gas Lighting Co., Boston, Mass.; Pelcher & Loomis Hardware Co., Providence, R. I.; Congdon & Carpenter Co., Bridgeport, Conn.; L. L. Ensworth & Co., Hartford, Conn.; N. T. Bushnell & Co., C. S. Mersick & Co., New Haven, Conn.; The Henry Walker Co., Norfolk, Va.; Manufacturers & Inventors' Electric Co., New York City; Doubleday Hill Electric Co., Pittsburg, Pa.; Carter & Gillespie Electric Co., Atlanta, Ga.; Erner & Hopkins, Columbus, O.; Walbridge & Co., Buffalo, N. Y.

#### ELECTRICAL PATENT RECORD.

This department is edited by OSCAR A. MICHRL. Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents. Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N.W., Washington, D. C. Copies of any patent published can be furnished upon paymt of ten cents. When ordering give name, date and title of invention wanted.

#### LETTERS PATENT ISSUED WAY 8, 1900.

#### ELECTRIC RAILWAYS AND APPLIANCES.

648,995. Electric-Train System, William B. Potter, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed March 31, 1898.
649,235. Trolley-Wheel. James A. Collins, Cincinnati, O. Filed April 3, 1899.

#### ELECTRIC LIGHTS AND APPLIANCES.

105. Apparatus for Electric Lighting, etc. Osborn P. Loomis, Depew, N. Y., assignor to Charles M. Gould, Buffalo, N. Y. Filed Feb. 15, 1899.
182. Apparatus for Producing Radiation and Light by Electricity. Charles H Stearn and Charles F. Topham, London, Eng.; said Topham assignor to said Stearn. Filed Jan. 20, 1899.
250. Marine Electric Light Fixture. George L. Martin, New York City. Filed Dec. 4, 1899.
105. Harvey. Hubbell, Bridgeport, Conn. Filed Oct. 9, 1899.

#### ELECTRICAL MACHINERY AND APPARATUS.

648,039. Electric-Circuit Closer. Harrison H. Fowler and William F. Pack, Waverly, Tenn. Filed Dec. 29, 1899.
648,951. Electric Switch. Augustus Hanson, Chicago, Ill., assignor of one half to John H. Goehst, same place. Filed Way 21, 1800.

Alternating-Current Motive Apparatus. Charles P.

649,006. Alternating-Current Motive Apparatus. Charles P. Steinmetz, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Aug. 16, 1897.
649,007. Frequency-Indicator. Charles P. Steinmetz, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Jan. 9, 1899.
649,008. Frequency-Indicator. Charles P. Steinmetz, Schenectady, N. Y., assignor to the General Electric Company of New York. Original application filed Jan. 9, 1899.
649,015. Current-Interrupter. Elibu Thomson, Swampscott, and Robert Shand, Lynn, Muss., assignors to the General Electric Company of New York. Filed March 8, 1900.
649,179. Transformer Secondary. Adolph F. Rietzel, Lynn, Mass., assignor to the Thomson Electric Welding Company, same place. Filed Sept. 23, 1899.
649,189. Electric Switch. William Ely, Providence, R. I. Filed April 29, 1898.

Filed April 29, 1898.

#### TELEPHONES AND TELEPHONE APPARATUS.

TELEPHONES AND TELEPHONE APPARATUS,
648,977. Signal for Selective Calling Appliances, Frank R. McBerty, Evanston, Ill, assignor to the Western Electric Company, Chicago, Ill. Filed Sept. 14, 1898.
648,978. Signaling Apparatus for Telephone Lines. Frank R. McBerty, Evanston, Ill., assignor to the Western Electric Company, Chicago, Ill. Filed June 7, 1899.
649,088. Spring-Jack for Telephone-Switchboards, Frank R. McBerty, Downer's Grove. Ill., assignor to the Western Electric Company, Chicago, Ill. Filed Jan. 26, 1898.
649,069. Supervisory Signal for Telephone-Lines. Frank R. McBerty, Evanston, Ill., assignor to the Western Electric Company, Chicago, Ill. Filed June 17, 1898.
649,076. Supervisory Signal for Telephone-Switchboards. Charles F. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed April 23, 1896.
649,077. Station Appliance for Telephone Toll-Lines. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed May 21, 1898.
649,078. Signal for Telephone Trunk-Lines. Charles E. Scribner, Chicago, and Frank R. McBerty, Downer's Grove, Ill., assignors to the Western Electric Company, Chicago, Ill. Filed May 21, 1898.
MISCELLANEOUS,

#### MISCELLANEOUS.

648,019. Electric Telegraph Apparatus for Use on Cable or Other Lines. Sidney G. Brown, Bournemouth, Eng. other Lines. Sidelled June 6, 1899.

1 June 6, 1899. Apparatus for Duplicating Phonograph-Records, nas A. Edison, Llewellyn Park, N. J. Filed Oct. 28,

Thomas A. Edison, Llewellyn Park, N. J. Filed Oct. 28, 1899.
649,003. Envelop for Storage Batteries. Elmer A. Sperry, Cleveland, O. Filed Oct. 7, 1899.
649,031. Electromagnet. Samuel M. Young, New York City, assignor, by mesne assignments, to Harvey J. Donaldson, trustee, Ballston, N. Y. Filed Jan. 7, 1892. Renewed Jan. 10, 1894.
649,086. Electromagnetic Coil. Richard Varley, Jersey City, N. J. Filed Jan. 2, 1990.
649,102. Telegraphic Receiving Instrument. Nicolas Flech-tenmacher, Bucharest, Roumania. Filed Aug. 3, 1898.
649,138. Electromechanical Typewriting System of Inter-communication. Albert D. Neal, Boston, and Howard F. Eaton, Quincy, Mass.; said Eaton assignor to said Neal. Filed Aug. 15, 1899.
649,234. Electric Bell-Striking Apparatus. Lorenzo D. Tillyer and Edward D. Tillyer, Dover, N. J. Filed Nov. 17, 1899.

1899.
649.349-649.350. Galvanic Battery. Clark M. Pratt, Waterbury, Conn, assignor to the Waterbury Battery Company, same place. Filed July 29, 1899.
649.351. Ground-Plug for Electrical Switchboards. Wallace I. Stockdon, Orange, Va. Filed Feb. 16, 1900.
649.385. Apparatus for Making Phonogram-Duplicates. Henry G. Wolcott, Fishkill-on-the-Hudson, N. Y. Filed July 25, 1899.
649.388. Lightning-Arrester Alexander J. Wurts. Pittsburg.

July 25, 1899.
Jass. Lightning Arrester. Alexander J. Wurts, Pittsburg,
Pa., assignor to the Westinghouse Electric & Manufacturing Company of Pennsylvania. Filed June 8, 1899.
Jass. Primary Electric Battery. Victor J. Busson, Paris,
France. Filed Nov. 18, 1898.



## GENERAL NEWS.

#### What is Going On in the Electrical World.

#### LIGHTING.

Atlantic Highlands, N. J.—In view of the increasing demand upon the electric light plant here the system will be duplicated as soon as possible.

Beaver Falls, Pa.—This town will erect its own electrie lighting plant.

Bentonville, Ark.—The city council is discussing the question of building an electric light plant.

Bloomfield, Ind.—M. L. Coombs and others have secured a franchise at this place for an electric light

Brooklyn, N. Y.—The Armory Board at a recent-meeting awarded a \$250 contract for installing electric light wires and connections in the Fourteenth Regient, rifie range, to Charles Hart.

Centralia, Wash.—The city council is discussing the advisability of purchasing a new dynamo for the electric light plant.

Clarinda, Ia.—This city intends to install an electric light plant in connection with the waterworks. W. E. Keller is engineer.

Columbus, O.—A resolution has been introduced into the council to issue about \$200,000 in bonds for a municipal electric light plant.

Dudleyville, W. Va.—Electric lights are to be one of the improvements at this place.

Glenwood, Ia.—The Glenwood Canning Company will put in an electric plant of its own.

Glenville, O.—This city will erect a new electric light plant this summer.

Horseheads, N. Y.—The board of trustees has decided to ask the firm of Knight & Hopkins, electrical engineers of Rome, N. Y., to make a preliminary estimate of the cost of a suitable electric light plant. When their figures have been received the proposition for the village to bond itself for this improvement will be submitted to a vote of the traverure. submitted to a vote of the taxpayers.

Ishpeming, Mich.—This city may vote on the instal-lation of a municipal electric light plant.

Keswick, Cal.—A. B. Kanaga, of San Francisco, contemplates the erection of an electric light and power plant at this place.

Lyons, N. Y.—The New York Central is planning the installation of a steam heating and electric lighting plant for the Lyons yards.

Marshall, Ill.—The people of this place have voted to issue \$40,000 in bonds for erecting an electric light plant and waterworks. Charles A. Purdurne, mayor.

Meridian, Miss.—The Meridian Mill & Elevator Company will increase its capital from \$15,000 to \$20,000, and build an electric light plant in connection with its mill.

Minocqua, Wis.—J. Woodlock of Merrill contemplates the erection of a new electric light plant at this place in the near future.

Mt. Pleasant, Is.—An electric light plant to cost about \$13,000 will be built here this summer.

New Bedford, Iil.—The erection of an electric light plant is contemplated here.

Norfolk, Va.—W. D. Pender, resident manager of a company of Philadelphia capitalists, has bought a site, and will begin the erection of an electric light plant here to cost \$150,000.

Philippi, W. Va.—The voters of this place have de-ided to issue bonds to erect a municipal electric light plant.

Ruston, La.—This city will hold an election this month to vote on the issuance of \$25,000 of bonds for an electric light plant and waterworks. J. W. Jones, mayor.

Schoharie, N. Y.—This village is to be lighted by electricity.

Seattle, Wash.—J. Leary, one of the promoters of the new electric railway now in process of construc-tion between this city and West Seattle, was lately granted permission to construct an electric light plant at West Seattle.

Springfield, Ky.—J. W. Lewis, W. C. McCord and J. C. McElroy are the stockholders of the new company organized here for the purpose of erecting an electric light plant.

Statesville, N. C.—At a recent meeting of the board of aldermen it was decided to enlarge the electric light

St. Peter, Minn.—This city will add a new 200 light dynamo and engine to its present municipal electric light plant. H. A. Hildebrant is superintendent of the plant.

Thorntown, Ind.—The municipal ownership of the electric light plant has been favorably voted on by the citizens of this place.

Teronto, Oat.—Bids are asked until June 1 for lighting this city for five or ten years from January 1, 1901. Address E. A. MacDonald, chairman.

Troy, O.—The people of this place have voted to issue

bonds for the purpose of erecting an electric light

Washington, D. C.—Sealed proposals will be received at the office of the District Commissioners until 12 m. May 19 for lighting the public streets, avenues, alleys and roads in the District of Columbia during the year ending June 30, 1901, with gas, electric incandescent and arc lamps.

#### STREET RAILWAYS.

Aurora, Ill.—U. P. Hord of this place, T. Snow of Batavia, J. H. Miller of Geneva, W. Hartsburg of North Aurora, and F. Y. Keator, of Chicago, are the incorporators of the new Aurora, Batavia & Geneva Electric Railway Company. The capital stock is \$10,000. It is the intention of the company to build a railway from Aurora to Geneva on the east side.

Augusta, Me.—The electric line from here to Togus is said to be a certainty.

Coldwater, Mich.—The right of way for an electric line from Battle Creek to this place has been secured as far as Union City. It is proposed to build the road

Ditroit, Mich.—A company will be formed by William Canham and J. B. McIllwain of Port Huron to build the proposed Port Huron & Lexington Electric Railroad.

Easton, Pa.—This city and the Moravian town of Razareth are to be connected by trolley. The Easton Consolidated Electric Company, which is controlled by Philadelphia capitalists, and a number of Easton business men are back of the movement.

Frankfort, Ind.—W. Pohlman of New York, representing an Eastern syndicate, was recently in this city to investigate the feasibility of building an electric line from Lafayette to this place and other points, and to install an electric car service for this city.

Grand Haven, Mich.—The Grand Rapids, Spring Lake & Grand Haven Transit Company, of which J. R. Whiting of St. Clair is the promoter, has been incorporated to operate an electric road.

Lancaster, Pa.—Rights of way for an electric railway between here and Ephrata, a distance of 15 miles, have been secured and work on the road will begin soon. The road with equipment will cost \$300,000.

Louisville, Ky.—The Louisville Bailway Company has decided to build an electric line to Riverview Park. The improvement will cost \$20,000.

Moodus, Conn.—A trolley road from here to East Hampton, a distance of seven miles, is the latest pro-ject being talked of in which Bridgeport capital is said to be interested to the extent of upwards of \$75,000. The main object of building the road is said to be for the purpose of hauling freight to the Moodus manufac-

New York City.-The State Board of Railroad Commissioners has approved the application of the Kings-bridge Bailway Company of this city to use under-ground and overhead currents of electricity as motive power on portions of its road, also for the Fort George and Eleventh Avenue Railroad Company to use an un-derground trolley.

Sanilac Center, Mich.—W. C. McArron, a projector from Detroit, has asked the council here for a franchise, and guarantees the road to be running by September 1, 1991. The road will reach this place via

Springfield, O.—The National Traction Company, which will build an electric line from Columbus to Indianapolis, made-application through N. H. Albaugh, of Piqua, for a franchise through Clarke County. Chas. W. Mackey is at the head of the project.

Tyrone, Pa.—A charter for an electric railway here has been secured. The road is to run from Birmingham to Glazerville, through this place.

### COMPANY MATTERS.

Canton, O.—The Canton-Massillon Electric Railway Company has increased its capital stock from \$600,000 to \$1,000,000. The increase is to be used for extensive improvements which the company has in contempla-

Dansville, N. Y.—The formal transfer of the property of the Dansville Gas & Electric Light Company has been made to the new corporation known as the Dansville Gas & Electric Company.

Elizabeth, Pa.—Bids are about to be let by the Elizabeth Electric Light, Heat & Power Company of this place for the erection of a new plant to take the place of the present one, which is unable to furnish power for its increasing business. The new plant will be over double the size of the present one, and will be equipped with new prochings. with new machinery.

Georgetown, D. C.—The Potomac Electric Light Company has secured a permit to connect the Hearst School with their electric conduits.

Gloucester City, N. J.—Negotiations are in progress for the amalgamation of the traffic interests of the Baltimore & Ohio Railroad and the Delaware River & Atlantic City Railroad, the proposed electric line between this place and Atlantic City.

Greensburg, Pa.—The Greensburg, Jeannette & Pittsburg Street Railway has been sold at trustee's sale to J. B. Head for the Harrisburg Traction Company

for \$25,000. The new company will at once make extensive improvements, and in a short time extend the trolley line to Pittsburg, a distance of 26 miles.

Livingston, N. Y.-The New York & Staten Island Electric Company has decided to spend \$200,000 in improving its plant here.

Norwalk, Conn.-The Connecticut Lighting Norwalk, Conn.—The Connecticut Lighting & Power Company, which controls the majority of the trolley roads and gas and electric light concerns in this State, has secured control of the water rights of the Saugatuck and Aspetuck rivers, the Southport stream, the Westport Water Company & Electric Light Company, and formed a new organization under the name of the Southport Water Company. More than \$500,000 is being apent in this place in the erection of a gas, electric light and power plant.

Oswego, N. Y.—It is stated that the new company which has purchased the gas and electric light plant in this place will spend about \$90,000 in improvements.

Ottumwa, Ia.—The Ottumwa Electric Steam Company will build several miles of new track this season. T. H. Merrill, president.

Port Clinton, O.—The Port Clinton Electric Light & Power Company will increase its capital stock from \$10,000 to \$20,000 to enlarge its plant. D. O. Hull,

Williamsport, Pa.—The increase in the business of Williamsport, Pa.—The increase in the business of the electric light company, and the demand that is being made for power will of a necessity in time compel the increase of the capacity of the power plants here. It is understood that the electrical interests here are contemplating the erection of a large central power house. When this will be built or where the location will be have not yet been taken into consideration.

#### MANUFACTURING.

Cincinnati, O.—The Bullock Electric Manufacturing Company recently received an order from a Montreal newspaper company for a complete electrical outfit, including dynamos and motors, amounting to several hundred horse power.

Grand Rapids, Mich.—The Grand Rapids Railway Company recently closed a contract with the A. P. Allis Company of Milwaukee for another 1,200 horse power engine, a duplicate of the one put into the Lyon street power house by the same company last year. The price is in the neighborhood of \$40,000.

Pittsfield, Mass.—The dynamos for the Trenton (N. J.) Gas & Electric Company will be connected directly with the engine shaft without belting. They are being built by the Stanley Manufacturing Company of this city.

## POWER AND TRANSMISSION PLANTS.

Boise City, Idaho.—The Trade Dollar Consolidated Mining Company will invest \$250,000 in a power plant at Swan Falls on Snake River for the purpose of generating power for its mines and mills at Silver City and to supply other consumers. W. White will be in charge of the enterprise.

Ellsworth, Me.—The Ellsworth Water Company, which now controls both water and electric lights in this city, has ordered an electric power plant with generator of 500 volts and 150 horse power. The plant will be in operation ready to furnish power within two months. Several applications for power have already been made to Superintendent Cushman.

Oil City, Pa.—The National Transit Company will build a power plant for its private electric lighting plant and pumps at the rear of the office building on Seneca and Center streets on Oil Creek.

Steelton, Pa.—The management of the Steelton Store Company contemplates the erection of an electric power plant.

Washington, D. C.—An appropriation of \$6,500 was recently made for the installation of electric power for the service of the Washington Monument, and for the addition to the boiler house, also an appropriation of \$20,000 for one dynamo and connections for the monu-

#### AUTOMOBILES.

Brooklyn, N. Y.—The trolley emergency wagons of the Brooklyn Rapid Transit Company, which are pulled by teams of horses, are likely to be replaced by automobiles. Officials of the company are testing a specimen of the Riker Motor Vehicle Company's mschines, and if the test proves satisfactory the company will adopt the automobile and do away with the horse wagons. The automobiles will cost about \$3,000 apiece and the company will need seven of them.

Circleville, O.—J. P. Smith, W. Scheyler, Benton G. Hedges and others, are interested in the Colonial Carriage Company recently organized here for the purpose of manufacturing carriages, buggies and automobiles.

New York City.—Last week an electric sutctruck weighing when unloaded 4½ tons was exhibited in the streets of this city. The truck is about the size of the large brewery wagons commonly drawn by three horses. The batteries supplying the motive power are stowed away under the driver's seat, directly in front of which is the steering wheal which leads away the of which is the steering wheel, which looks exactly like the wheel on the front of a cable car. The vari-ous controlling levers, brake, and other apparatus are within easy reach of the driver.



# THE TELEPHONE WORLD.

## The Bell Telephone Metamorphosis.

The Boston "Post," referring to the removal of the Bell Telephone Company from Massachusetts to New York, says:

"As the Bell Telephone Company leaves its Massachusetts chrysalis to take wing as a New York butterfly, some incidental features of the change attract public attention. The stock of the Bell Company, which a week or ten days ago was selling in small lots at 344, sold as low as 311. And more than 1,000 shares changed hands in the Stock Exchange recently—an exceptional record for this stock.

"What is the significance of this rush to sell at lower prices just at the time the Bell Company is leaving Massachusetts? The increase in earnings, gross and net, has not been proportionate to the enormous output of instruments during the past year; and this would seem to indicate that the company is getting less returns from the use of its instruments. Furthermore, the net output of telephones for the four months ending April 20, 1900, shows a falling off in comparison with the net output for the same period last year. These two facts, taken together, seem to indicate that at last the great telephone monopoly has begun to feel the effect of competition.

"Further than this, in the great stock-watering arrangement whereby the Bell Company becomes a New York corporation, the capital stock is doubled, and additional stock to the amount of one-fifth the increased capitalization is to be issued. To keep up the pace of 15 per cent. dividends on the original Bell Company stock it will be necessary to earn 7½ per cent. on the watered capital and enough more to pay an equal profit on the new issue about to be distributed. The growing readiness to sell, which the Boston stock market reports show, and the remarkable drop in quotations of price, seem to imply a doubt of the efficacy of the change to produce the usual fat surplus at the end of the year."

# Plans of the Knickerbocker Telephone Company.

The Knickerbocker Telephone & Telegraph Company desires to announce that it has commenced the construction of its plant, which will be extended to all the five boroughs of New York City. Its rates for unlimited service will be \$120 per year for business houses, and \$60 a year for private residences. Its charges for limited service will vary from \$60 a year for 700 messages to \$110 a year for 2,500 calls. Special rates will be made to extensive users of the telephone. The offices of the company are located at 416-422 Broome street, New York City.

Mr. V. M. Tyler of the Southern New England Telephone Company was in Norfolk, Conn., recently, looking over the plant which his company has purchased. The company is considering the best means of running the Norfolk plant, and it is reported is looking at the West Norfolk Axle Works with a view to moving the plant of the Norfolk Electric Light Company thither. Should this come to pass water power will in all probability be substituted for gas, which at present runs the plant.

Advices received from Lawrenceburg, Ky., state that the case of the East Tennessee Telephone Company vs. the Anderson County Telephone Company was decided in favor of the defendant. The new company seeks to establish its plant in Lawrenceburg in opposition to the East Tennessee Company, and scored a complete victory. The old company claimed an exclusive franchise.

The New York & New Jersey Telephone Company has completed laying a mile and a half of subway in Flushing, L. I. The wires are taid in wooden boxes creosoted and filled in with a tar cement, which are buried beneath the surface of the ground. This is the first of a series of similar subways to be laid by this company in all the thickly settled portions of that borough.

The American Electric Telephone Company was incorporated at Trenton, N. J., on the 10th inst., with an authorized capital of \$3,000,000. The company is empowered to manufacture telephones and other electric appliances. Of the capital \$1,000,000 is preferred stock with 6 per cent. non-cumulative dividends. The incorporators are: Barnett R. Ruggles, Henry M. Haveland of New York, and James C. Young, Jersey City

The Telephone, Telegraph & Cable Company of America, which recently purchased the plants of the independent telephone companies in Westchester County, has completed its line through the boroughs of Manhattan and the Bronx, and is now up to the city line of Mount Vernon. A large force of men is at work rushing the construction of this line so that the Mount Vernon and New Rochelle subscribers of the company may have a New York City connection.

#### The New Signal a Success.

The new signal system, which has been recently introduced into the exchanges of the John street, Riverside Drive, Madison Square and Harlem sections of New York City, has proved both economical and capable of much saving of time. Instead of the old scheme of having the girl at "Central" notified of a call by the noisy falling of a brass indicator, the desks of the new exchanges show a multitude of minute electric light bulbs. These work automatically with the movements of the telephone that call for a number, and also the one at the other end, different combinations of lights meaning different things to the girl at the board.

She can tell without constantly asking "Have you finished?" exactly when the talking parties wish to be disconnected, and the amount of work that she does with both hands and mouth is tenfold less than it was under the old system. Then, too, the 'phones connected with these new exchanges are not encumbered with the old bell cranks, but a simple removing of the receiver from its hook lights the tiny electric light on the central switchboard.

The mechanism is so arranged that when any one answers a ring at his 'phone he never has the ringing continued after he has taken up the receiver, for the removing of the latter from its hook destroys the current which rings the bell. Hence the old trouble of having the drum of one's ear shocked violently is obviated. The subscriber's 'phone, besides occupies much less space, as the clumsy battery which formerly accompanied each one has been abandoned, its place being taken by a common battery that is placed at the exchange, and does work for every individual wire having a terminal there.

# The Toll System of Telephone Charges in Germany.

From a German contemporary we learn that the larger proportion of telephone subscribers in Berlin have preferred the old tariff system of a fixed sum per year, and only about one-fifth (8,000 subscribers) have elected to be charged according to number of conversations. The latter class of subscribers, says the "Electrician," London, include chiefly the small offices and shops, and it is considered that the attraction to them of this system of charging is that they are entitled to loan their telephones at the rate of 5 pf. per conversation. Doctors, lawyers and private persons who have the telephone chiefly to enable others to call them up have naturally preferred this system also. The fixed rate system has been preferred by the owners of larger restaurants, hotels, cigar shops, etc. The Bavarian and Wurtemburg post offices have followed the example set by the Imperial post office, and have also made the toll system optional. In Munich 516 out of 5,500 subscribers have chosen it, in Nuremberg 390 out of 2,800, in Augsburg 101 out of 580, in Wurtzburg 120 out of 580, in Furth 38 out of 540, in Bamberg 43 out of 230, in Regensburg 31 out of 230, and in Landshut 2 out of 55.

The People's Telephone Company of West Superior, Wis., which is making the fight against the old Bell Company, has already received orders for more instruments than the present size of the switchboard will accommodate, and has ordered another section of board on this account. The old company still continues to do business, but has lost a good many subscribers since the new system has been working well.

The Bell Telephone Company in a statement at Buffalo, N.Y., relative to the settlement of the strike of their linemen, who returned to work last week, say that on January 1 the company increased the wages of its men to \$2.25 and on April 26 to \$2.50. At a meeting held recently the company declined to concede the demands of the men for eight hours' work, time and a half over time and double time Sundays and holidays, and the men decided to waive these points and return to work, the company agreeing to protect and retain them in their positions.

The Keystone Telephone Company of Philadelphia has been granted a very liberal franchise by the councils of that city. The Bell telephone people opposed the granting of the franchise, but the councils of Philadelphia believe in improved and cheaper telephonic service.

A dispatch from Monroe City, Mo., states that during a heavy thunder storm recently lightning struck the local telephone lines, destroying nearly 200 connections and wrecking the switchboard. It being Sunday most of the employes were absent and no one was injured.

At a special meeting of the New England Telephone & Telegraph Company held in New York City last week it was decided to increase the capital stock of the company from \$15,000,000 to \$22,000,000.

## No Municipal System for Chicago.

A dispatch from Chicago to the N. Y. "Times" states that Mayor Harrison recently received such a favorable proposition from the Chicago Telephone Company regarding the overhauling and maintenance of the police and fire telephones that he directed City Electrician Ellicott to abandon his plans of inaugurating a municipal system. The offer of the corporation means a reduction from \$5 to \$1.50 per instrument, or a total cut of \$5,250 for 1,500 telephones. Mayor Harrison said he could not see how the city could install the system and avoid losing money in view of the company's offer. The city telephone bill last year was \$7,500. All the city will have to pay now will be \$2,200.

#### The Michigan Telephone Company.

Under Erie management the Michigan Telephone Company has in sixteen months made a greater gain of subscribers than under the old management covering a period of twenty years. The increase, it is claimed, exceeds 100 per cent., or 19.000 subscribers, and the total number connected June 1 will be 38,000.

In the United States Circuit Court of Appeals, Richmond, Va. on May 7, Judges Simonton, Brawley and Purnell presiding, the case of the Southern Bell Telephone & Telegraph Company against the City of Richmond came up for argument on appeal from the decision of the Circuit Court of the United States for the Eastern District of Virginis. The question involved in this case is whether or not the city can, after granting the Telephone Company the right to occupy its streets, revoke said right and cause the Telephone Company to remove its poles and wires from its streets. The city attorney claims it can, and the attorneys for the Telephone Company contend that the Legislature, having reserved the right to repeal the charter, the Legislature is the only body that can repeal the same.

The city of Florence, Ala., is just now much interested in long distance telephone connections, and the outlook for connection with the outside world in a short time is said to be very promising. A special representative of the Bell Telephone Company is in Florence with a view of perfecting arrangements for the connection. A private telephone line now connects that city with Iron City, Tenn., and from that point there is another line to Columbia, Tenn., where long distance lines of the Bell Company touch. Arrangements will either be made to connect at Columbia by the purchase of the private lines between Florence and Columbia, or else the Bell Company will build direct to Florence.

The city council of Winfield, Kan., has granted a fifteenyear franchise to W. B. Hurst, of Springfield, Mo., to operate a telephone system in Winfield, the city to get a firealiarm system free and 4 per cent. of the gross receipts. There were three independent companies asking for franchises. Mr. Hurst has thirty days from May 8 to accept the conditions, ninety days to begin work, and nine months to complete the system. He is to deposit a certified check for \$5,000, and the maximum rates are to be \$2 a month for business houses, and \$1 for residences.

The Harrisburg, Pa., councils are being urged to pass the ordinance giving the Harrisburg Telephone & Telegraph Company the right to erect its poles and wires in that city. The new company is after privileges at Middletown, Royalton, and other Pennsylvania towns.

A telephone exchange is about to be installed at Morehead, Ky., and a line will be built to connect with the long distance system.

A new telephone company is said to be likely to become a competitor of the Bell Telephone Company at Lockport, N. Y.

The Automatic Telephone Company has asked for a franchise to erect poles and string wires through the streets of Brockton, Mass.

A telephone exchange has been opened at Flatonia, Tex., with fifty subscribers.

#### TELEPHONE INCORPORATIONS.

The Northern Electric Telephone Company, Willmar, Minn. Capital stock, \$30.000. Incorporators: D. N. Tallman, J. Williams, A. Larson, all of Willmar; J. L. Schoch, C. H. Dirks, both of New Ulm.

The Home Telephone Company of Champaign, Champaign, Ill. Capital stock, \$20,000. Incorporators: W. A. Heath, D. C. Morrisey, M. Savage, all of Champaign.

The Camden Telegraph & Telephone Company of Camden, N. Y. Capital stock, \$1,000. Incorporators: Miner P. Osborne, Maria Osborne, Benton Osborne and Walter Buddles,

# ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers a compiled from special reports received by Electractry from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to see, re accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; extension; gon., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; C., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

# STOCKS.

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Albany, N Y May 14. United Traction(Oonsolidation of the Albany and	100	<b>∌</b> 5, <b>000,00</b> 0	<b>\$</b> 5 000 000	1 <b>% % Q.</b> ,	124	125	Hartford Conn.—May 14: Hartford Street By. Co	100 100	\$4,000,00t 1,000,000	\$200,000 247,000	3 % 8., Oct.,	15 <b>0</b>	=	
Troy City Bailway.)		1					Holyoke Mass.—May 14. Holyoke Street Ry, Co	100	400,000	400,000	δ % Δ., June,	2073	2/2	
Allentown Pa.—May 14:							Hoboken, N. JMay 14.							
Allentown & Lebigh Val. Trac. Oo.	.	4,000,000	1,500,000		-	15	North Hudson Co. (N. J.) Ry. Co Indianapolis, Jr d- May 14.	25	1,250,000	1,000,000	8 %,	150	-	
Bridgeport, Conn—May 14: Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	105		Indianapolis Street Ry		5,000,000	5,000,000	*******	24	24 ×	
Baltimore Md.—May 14 a United Rail ways & Elec. Cocom.	. 50	24,000,000	18,000,000	•••••	181/4	181/2	Lancaster, Pa.—May 14 Pennsylvania Traction Co Lancaster & Col. Electric By	100	10,000,000	9,900,000 87,500		-	=	
BOSton, Mass.—May 14 New England Street By	100 100 50	4,000,000 2,000,000 10,000,000	4,000,000 2,000,000 9,085,000 6,400,000	1 % Q., Jan.15, 6 % S., A. & O. 8% % S., Oct., '19. 4 % S., Jan. 2% % Aug. 59,	15 85 98 112 144	16 87 94 114 145	West End Street Railway	100	2,500,000		1½ %., April. 2½ % 8., Oct. 1,	78 110	79 111	
Brooklyn N. YMay 14: Brooklyn City By Brooklyn Rap. Transit Oo., treerif eBrooklyn Heights Raliroad	100	43,000,000 200,000 12,000,000	200,000 12,000.000	*********	281 643 107 207	236 695/4 109 289	Twin City Rapid Transitcom Twin City Bapid Transit? % pid Montpeal, Canada.— May 14: Montreal Street Ey. Co Toronto Street By. Co	50	4,000,000	4,000,000	1% % Oct. 8 % 8., M. & N. 1% % 8., J. & J.	68% 186 241% 19634	187	
eBrooklyn, Queens Co. & Sub. RB. Coney Island & Brooklyn RB. Kings County Elevated Kings County Traction Co.	100	2,000,000 4,750,000 4,500,000	1,884.200 4,750,000 4,500,000	2%% Nov., 99 1 % July	325 75	830	Memphis Tenn.—May 14: Memphis Street Railway Co	. 100	500,000	500,000		25	-	
/Atlantic Avenue RailroadgBrooklyn, B. & W. E. Railroad	50		2,000,000			•••	New Haven & Westville RR New Haven & Westville RR New Haven & Centerville	100	1,250,000	2,000,000 1,000,000	8 % S., Pept. 2% % A., July	89	41	
Buffalo N. Y.—May 14: Buffalo & Niagara Falis Ricc. Ry *Buffalo Railway Co	100 100			1 % Q. Dec., 99	74 99	75 100	New Orleans, La.—May 14	.   26	1,000,000	600,000		15	46	
Columbus O.—May 14: Columbus Street Railroad Columbus Street Railroad, pfd	. 10 10			1 % Q., Feb.	26 25	28 88	Canal & Ciaiborne RR. Co	100 100	1,200,000		1 % 8., July, 1 % % Q., Oct.	14854 225 55	158 24 96 26	
Charleston, S. C.—May 14 Charleston City Ry. Co	50 25	100,000		8 % B.		::	aCrescent City RRguar bNew Or. City & Lake RRguar Orleans Railroad St. Charles Street Railway	100 100 56	2,000,000 500,000	2,000,000 2,000,000 185,000 1,000,000	8 % S., Jan., 4 % S., Jan., 1 ½ %., June, 1 ½ %. Oct.,	2014	52	
Chicago, Ill.—May 14 Chicago City Ry. Co. Chicago & South Side E. T. RE. Lake Street Elevated RR. Metropolitan West Side Elev. Ry. Meth West Side El., pfd. North Chicago Street RR. ANorth Chicago City RR. South Chicago City Rallway. West Chicago St. RE. Co. Union Traction Ry	. 10 . 10 . 10 . 10 . 10	0 10,000,00 0 15,000,00 0 15,000,00 0 10,000,00 0 500,00 0 20,000,00 0 1,250,00	10,000,000 17,600,000 9,000,000 6,600,000 249,900 1,608,200 18,189,000 624,900	Feb 28 1900.	264 827 803 221 110 24 763	26 ±01/4 227  26	New York—May 14: Central Orosstown RR. cOhristopher & 10th Sts. RR. guar Dry Dock, E. Brdw'y & Battery RR dMetropolitan Street Ry. Co. eBleecker St. & Fulton Fy. Ry. guar fBroadway & Seventh Ave guar gOen. Park, N. & E. Rivers RR. gua kEighth Avenue RR. 42d St. & Grand St. Ferry RR. gua fNinth Avenue RR guar l&ixth Avenue RR	100 100 100 100 100 100 100 100 100 100	750,000 800,000 2,000,000	600,000 650,000 1,200,000 45,000,000 2,100,000 1,800,000 748,000 800,000 2,000,000	2½ % Q. Oct., 1½ % Q. Oct., 1½ % Q. Nov. 2½ % Q. Feb., 1900 2½ % A., July, 2½ % Q. 144 % Q.	270 175 100 146% 85 233 119 895 895 198 203	800 186 1243 147 86 240 201 400 410 205 210 4(5	
Cincinnati, Ohio.—May 14; Cincinnati Inc. Plane Rypfd Cincinnati Inc. Plane Rypfd Cincinnati, Newport & Cov. St. Ry IOincinnati Street Ry. Co	10	0 1,000,00 0 150,00 0 4,000,00 0 18,000,00	575,000 150,000 8,500,000 14,000,000	) % % Feb. 2% % Feb. 1% % Q., Jan. 1% % Q., Jan.	83 124)		Second Avenue RR. Third Avenue RR. ***********************************	100 100 100 100	2,500,000 12,000,000 2,500,000	1,862,000 10,000,000 2,500,000 2,000,000	2 % Q., Jan., \$1.75 p. sh. Feb.	199 1:8 (0 190	201 108½ €0 200	
Cleveland, Ohio.—May 14: Akron, Bed. & Clev. Elec. By Cleveland City By Cleveland Electric By	10	0 1,000,000	1,000,000	1% % Jan.   34 % Jan.   34 % Jan.   34 % Q., Oct., '99	48 100 87	50 101 88	North Jersey Street Railway Co United Electric Co. of New Jerse; Pittsburg, Pa.—May 14: Allegheny Traction Co	100	500,000 504,000	500,000 500,000	115% % A.	60 28 225 55	51 29 24 56	
Detroit, Mich.—May 14: Detroit Citisens' Street Ry Ft. Wayne & Belle Isle Ry Rapid Railway Co Detroit Electric Railway Wyandotte & Detroit River Ry	10	2,000,000	1,250,000 1,200,000 250,000 1,000,000	••••••••	1003 175 90 100	i00 ii0	oConsolidated Traction Cocom Consolidated Traction Copfd pCentral Traction Co qCitisens' Traction Co rDuquesne Traction Co sPittsburg Traction Co Federal St. & Pleasant Valley Ry.	50 50 50 50	9,478 850 1,500,000 8,000,000 8,000,000 2,500,000 1,400,000	9,000,000  900,000  8,000,000  8,000,000  1,900,000	)2 %, Jan. )3 %, Nov. )1 % % Nov. )6 % A. )6 % A. )3 %, Nov. )2% %, July,	25 64½ 69 12⅓ 12⅓	263 6:3 70	
Dayton O.—May 14 Oity Railway Cocom Oity Railway Copld People's Street Railway	10	0 1,500,00	1,470,600	12 × 6.	147 170 114	145 115	Pgh., Allegheny & Man. Trac. Co Pittsourg & Birmingham Trac. Ry. Pittsburg & West End Ry. United Traction Cooom United Traction Copref	50 25 50 50	8,000,000 1,500,000 ₹1,000,000	1,500,000 8,000,000 17,000 000	2%, Aug. 1%, Oct. 5% A., June J. & J.	41 513/4	425 143	

\*\* Unlisted. † Full paid. | Outstanding. † Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to New Orleans Traction Company at 8 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

s Leased to Cant Street Ry. for 99 years; lease assigned to Met-opolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Ry.

f Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

A Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.

i Leased to Metropolitan Street Rallway for 18 % on stock

f Leased to Metropolitan Street Rallway for 18 % on capital stock.

n Dividends of 13/2 % yearly guaranteed by Consolidated Traction Company.

c Controls by lease the Alleg'ny, Cent., Oitizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Uonsolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Consolidated Traction Company for 8 % on \$8,000,000 capital stock.

Leased to Consolidated Traction Company for 6 % on \$8,000,000 capital stock.

Leased to Consolidated Traction Company for 6 % on applial stock.

Leased to Consolidated Traction Company for 6 % on applial stock.

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PASSE	NG	ER I	RAILW	AYS.			TELEPHONE AND TELEGRAPH COS.						
		Capital	Stock.	Bare and Date of					Capital	Stock.	Rate and Date of		
name.	Par	Authors'd	Issued.	Last Div.	E3d.	Asked.	NAME.	Par	Authors'd	Issued.	Rate and Bate of Last Div.	Md.	-
New Begiord Mass- May 14		[			Ī	Ì	Boston, Mass May 14	<del>i</del>	Ì	<u></u>	1		لنتا
Union Street Railway Co Northampton, Mass-May 14	100	\$850,000	\$850,000	2 %, Feb.	160	165	American Bell Telephone Co Eric Telegraph & Telephone Co	. 100 100	50,000,000	28,650,000	1% % Q., Jan. 1 % Q., Feb. 20,	300 104	104% 184%
Northampton Street Bv	100	800,000	225,000	4 % A., June.	170	178	New Ringland Telephone Co New York.—May 14	·  ··	10, <b>394,6</b> 00	10,904,600	\$1.50 p. sh. Feb	184	184%
Omaha, Neb May 14:	100	5,000,000	5,000,000	8 % A. and N.	55	65	American Telegraph & Cable Co *Central & South Am. Teleg. Co	100	14,000,000	14,000,000	1323	90	94 107 170
Paterson. N. J May 14							*Commercial Cable Co	100	10,000,000	10,000,000	12 x q 12 x q 12 x q 13 x q 13 x q 13 x q 14 x q 15 x q	105	170 52
Providence, R. I.—May 14:	100	1,250,000	1,250,000	***************************************	54	••	Erie Telegraph & Telephone Co	100 100	5,000,000 5,000,000	4,800,000	1 % Q., Feb., 1 % % Q.	112	118 199 116
United Traction & Electric Co	100	8,000.000	8,000,000	14 %, Oct. '98	109	111	#International Ocean Tel Co.guard% Mexican Telephone Co *New York & New Jersey Tel. Co					294	<b>**</b>
Philadelphia.—May 14 Fairmount Park Trans. Co 150 pd.	50	2,000,000	1,770,000	2 %, Dec. '19.	28	24	*Pacific & Atlantic Telegguar. 4 %	25	0.000.000	15.000.000	2% % Q., Jan., '99. 2 % 8. 1 % Q.		162 75
destonville, Man. & Fairmount Best'nvl'e, Man. & Fairm't6 % pfd. aFairmount Pk. & Had. Pass. Ry.	50 50 50	1,966,100 588,900 800,000	[1,966,100 [588,900	2% %, July 15, '49. 8 % S—July, '99.	47 75 75	48 76 76	*Postal Telegraph Cable Co*Sout'n & Atlantic Telg. Co.guar.5 % †Commercial Union Telegraph Co	25	950,000 600,000	559,525 500,000	1 % Q. 2% % S. 8 % S., Jan., '99. 1% %, Q., Jan. '99.	1118	160
aFairmount Pk. & Had. Pass. Ry. Union Traction Co \$12½ pd sEjectric Traction Co	50 50	80,000,000	29,980,450	8 % Feb. 1, 19	361/4	3634	Western Union Telegraph Co †Div. guar. by Postal Teleg. Co.	••	• • • • • • • • • • • • • • • • • • • •	97,870,000	11/4 %, Q, Jan. '99.	793/	19×
dOitisens' Passenger Ry Frankford & Southwark Pas. R	50 50		†192,500   1,875,000	\$8 share Q. \$14sha'e A—Apr.\$9	<b>445</b> <b>4</b> 50	451	Miscellaneous.—May 14: American Dist. Teleg. (Phila.)	26	400,000		1 % Q.		-
(Lehigh Avenue Ry. Co	50 25		1.000.000	A. & O.	48 90	90%	Bell Teleph, Co. (of Canada.)	100	8,960,000	8,561,000	2 % B.	26 136 61	ä
descond & Third Streets Ry People's Traction Co	50 50 50	10,000,000	16,000,000	\$9 share A, Mar. 98 8 %, A., April, '98. \$5.25 share—1898.	150	i51	Chicago Telephone Co	100 100		750,000	•••••	第5条を発送され、	200
Gormantown Passenger Ry Gireen & Coates Passenger Ry. APeople's Passenger Rycom.	50 26	500,000	150,000	8 % Jan., 1898.	151	152	Empire & Bay States Telegraph Co. Hudson River Telephone Co *Northwestern Telegraph Coguar	100 50		2,000,000 2,500,000	189	199 134	逕
APeople's Passenger Rypfd. (Philadelphia Traction Co	 50	750,000	277,402 [20,000,000	\$2 p. sh., Oct. 98.	 96	961/4	Providence (R. I.) Teleph. Co Southern New Eng. Teleph. Co	50		2,500,000	**************************************	MX.	
(Catherine & Bainbridge St (Continental Pass. Byguar	50 50		580,000	6 % A—Mar., '98. 86 share—July, '98.	158	157	ELECTRIC LIGHT				CAL MFQ	. 00	حنب
Philadelphia City Pass. Ry	50 50 50	1,000,000	475,000	\$7.50 share July '98 \$8.50 share July '98	208 100	2081/4	Boston, MassMay 14:	1					r <del>-</del>
¡Philadelphia & Gray's Fy. RR ¡Ridg. Avenue Passenger Ry ¡Pniladelphia & Darby Ry.guar.	50 50	750,000		\$12 share, July '98. \$2 share July, '98.	8.8%	809	Fort Wayne Electric trust receipts Ft. Wayne Elec Co. T. Sec. Series A.	25			••••	115 36	뿧
117th & 19th Sts. Paes. Ry. guar Thirteenth & 15th Sts. Paes. Ry.	50	1,000,000	250,000 835,000	1½ % 8., July, '98.   \$11 sh. A., July, '58	300	••	deneral Electric Co. [old] "	100 100		80,460,000 18,276,000	2 % Q., Aug., 1898. 1% % Q., Jan., 1900	184	181%
West Philadelphia Pass. Rv	50 50		900,000 750,000	\$9.50 shre, July '98 \$10 share, July '98	262	240 268	TH. Elec. CoT. Secur., Series D. Westinghouse Elec. & Mig.Co.com. Westinghouse El. & Mig. Co. pid.	50 50		146,700	1% % Q., Jan.,	46 61	47
Rochester, N. Y May 14	100	5 000 000			.7	- 18	Westinghouse El. & Mig. Oo. assent.		11,000,000	8,195,126	·····	43	~
Richester Railway Co	100	5,000,000	5,000,000	**********	••	10	New York.—May 14 Edison Elec. Ill'g Co., New York	100		7,988,000		119	199
Meaning Traction Co	50	1,000,000 850,000	1,000,000 850,000	Semi-an.,Jan. & Jy Jan., '98.	188	26 	*Edison Elec. Ill'g Co., Brooklyn Edison Ore Milling Co Electric Vehicle Cocom.	100 100	4,000,000	2,000,000	134 % Oct., '86.	3	5
tEast Reading Electric Ry	50	1,000,000	11,000,000	Jan., '98.	70	••	†General Electric Oo. [old]com. General Electric Oo. [new]"	100 100	40,000,000 18,276,000	80,460,000 18,376,000	3 % Q., Aug., 1898. 1½ % Q.,Jan., 1900.	184	M M
Fourth Street & Arsenai Ly Jefferson Avenue Ly. Co	50 50		150,000	2 % Dec., 1888.			Interior Conduit & Insulation Co Kings Co. El. L. & P. Co	100	1,000,000	1,000,000 2,500,000			155
Lindell Ry	100		2,400,000	1% % Jan., '99.	••	••	Pittsburg, PaMay 14		· ·	1			
Cass Avenue & Fair Grounds	ii00	2,500,000 2,000,000	2,500,000 1,500,000	4 %, Oct., '98. 2% %, Jan., '99. 1% % Jan., '99. 50c., Dec., '89.	:-	••	Liegheny County Light Co  East End Electric Light Co	100 50	500,000 500,000	500,000 800,000	J. & J. Q	-	### 
St. Louis RR  Wissouri RR Pe pple's RR. Co	100 50	2,400,000	2,000,000 2,800,000	2½ %, Jan., '99. 1½ % Jan., '99.	••	••	Philadelphia, Pa.—May 14 Edison Electric Light Co	100	2,000,000			144	14434
United Electric Rycom United Electric Ry6 % pref.	50 50 100	500,000	500,000 500,000	8 %, Jan., '99.	23¾ 18	2( 58%	*Electric Storage Battery Cocom. *Electric Storage Battery Copfd.	100	8,500,000		*****	80 74	144 <b>%</b> 80% 88
t. Louis & Suburban Ry	100 100	2,500,000	2,500,000 4,000,000	8 % A., July, ': 9	<b>6</b> 8	10	Northern Elec. Light & Power Co Southern Elec. Light & Power Co	10 10	550,000 187,500	550,000 187,500	•••••	3	10%
San Francisco, Cal May.							Miscellaneous.—May 14: Bridgeport (Conn.) Ricc. Lt. Co	25	500,000			أتما	4
C. lifornia St. Cable RR Leary Street Park & Ocean RR Market Street Ry	100 100	1,000,000	875,000	50c. monthly. \$2.50 share, '96. Q., 60c. per share.	117 80 61½	119	Missouri-Edison (St. Louis)com.	25			••••	20 10 10 10	<b>2</b>
Presidio & Ferrice RE	100	1,000,000	550,000		••	16	Eddy Electric Mfg. Co	100 26	\$50,000 175,000	•••••	:::: •	199	WAYE .
Scranton Pa - May 14 Beranton Railway Co	50				29	80	New Haven (Conn.) Riec. Lt. Co Narragansett (Prov., R.I.) Elec. Co. Bhode Island Elec. Protec. Co	100 50 100	1,200,000 1,200,000		8 % Q., Oot.,	195 196 110%	1
m Scranton & Carbondale Trac. Co m Scranton & Pitiston Traction Co	100 100	500,000 1,060,000			1634	••	Boysi Elec. Co. (Montreal)	100	1,000,000 1,085,000	1.086.000	<b>XQ</b> 1	199	200 181
Springfield III.— May 14 Springfield Consolidated By	100	750,000	750,000	***************************************			Woonsocket (E. I.) Electric Co	100		•••••	}	105	100 106
Springfield OMay 14				***************************************		••	†On Aug. 17 last by a majority vot to \$20,827,200, of which \$18,276,000 is o Recently acquired the Edison Illu	e of comn	the stock! on and \$2	olders th ,551,200 pr	e capital stock wa eferred.	s redi	noed .
Springfield, Mass.—May 14	100	1,000,000	1,000,000	***************************************		11	Recently acquired the Edison Illupany, the Municipal Electric Light	umir Co.	asting Co.	of Brooki	yn and its constit	ueni	•
pringfield Street Ry	100	1,200,000	1,166,700	5 % A.	207	212	ALLIE	D	INDU	TRIE	8.		
Toronto Canada.—May 14 Toronto Street Ry	100	6,000,000	6,000,000	18/ S/ R	971/2	93	Boston MassMay 14	_1					-
Montreal Street Bailway Co		4,000,000		1 <b>%</b> 8	2512	252	Delaware Gas Light Copref.	50 50	500,000	500,800 200,000	J. & J. J. & J.	7274	=
Washington, D. C.—May 14- Belt Ry. Co	50		500,000			.::	American Electric Heating Co Street By. & Illu'g Propertiespfd United Electric Securities Copfd.	100	4,500,000	1,948,700	2 p. sh. Jan. 26, '90' 8.50 p.sh. Nov' 99		
Valuable Ry. Co	50 50	112,000,000 400,000 707,000	400,000	60c. per sh, Uci. 19.	25	105 40	New York.—May 14:						
Georgetown & Tenallytown Ry Metropolitan RR. Co	50 50	200,000	200,000 458,900	2½ % Q.	15	16	Consolidated Electric Storage Co Safety Car Heating & Lighting Co		•••••	*******	••••		
Worcester, MassMay 14							Worthington Pump Copfd	100 100	5,500,000 2,000,000	5,500,000 2,000,000	XA		
Worcester Traction Co 6 % pfd.	100 100 100	2,000,000	2,000,000	8 % S., Feb., '98.	81 1に4次		Philadelphia Pa.—May 14 Electro Pneumatic Trans. Co	10	1,500,000			-	•
Wercester & Suburban Street Ry Wilkesbarre, PaMay 14		·		4% %, 1897.	•••	85	United Gas Improvement Coscrip. Welsbach Commercial Cocom.		10,000,000				) 21
Wilkesbarre & Wyoming Val. Trac.					26	29	Welsbach Light Copfd.	100	500,000 <b>525,10</b> 0		×Q	12 40X	76 46% 1%
* Unlisted. † Paid in. † Full a Leased to Hestonville, Man & Consulidation. Fluctric. Pro-	LPAI	rmount Pa	assenver H	v for 6 % on atomb	per a	որստ.	Welsbach Light Co., Canada Pittsburg, Pa.—May 14	5	500,000		••••	"	13%
b Consolidation Electric, Peo charges and all indebtedness of C Traction Company.	ons	iituent an	d leased	companies assume	d by	Union	Carborundum Mig. Co	100 106	200,000 1,000,000	200,000 1,000,000	· •		98 .
c Practically all shares owned d Lease to Frankford & Southw	by T	nion Trac Passenge	tion Comp	any. med by Electric Tr	action	n Co.	Miscellaneous.—May14:		-,,	·	_	ı	
Controlled by Frankford & Se	oшр	wuy. wark Раз	enger Rai	lway			*Barney & Smith Car Copfd.  *Barney & Smith Car Copfd.  Rillings & Spencer Copfd.	100	******	1,000,000 2,500,000	9 % II		107
g Leased to People's Passenger h Majority of stock owned by I i Leased to Union Traction Con	Rai	way at \$5 le's Tract	per share. ion Comps	nny.			Billings & Spencer Co	25 100 100	1,260,000		XX Feb	10s	36 30
j Lease transferred to Union To	action	on Compa any at a 1	ny. reptal of s	10,000 per annum	jn 1	866-7-9	*Pratt & Whitney Coeom. *Pratt & Whitney Copfd	100 100	•••••	•••••	~~	ا قد	4
p.a. \$20,000 in 1899-1900 and \$30,000 declared as a dividend semi-annua	per lly.	annum ti	bereafter,	payable semi-annu	ally,	rental,	Pratt & Whitney Co	••	•••••	••••	% Sept 1,'99,	: : : :	4 59 66 60
Dividend of 6 % guaranteed b	Dy 1	teading Tr	raction Co	mpany.			St. Charles Car Co	10:	500,000	******		# þ	<b>2</b>
Leased and operated by the S	or all	ton Reliw	my UO., fo	rmerry Seranton Tr	actio	<b>= 00,</b>	Walisted.	ı	1		. (	•	

# BONDS.

PASSEN	GER R	MILWA	7.		_		PASSENGER RAILWAY.						
	Amor			Interest				Amo			Enterest		
NAME.	Authorized.	Issued.	Due	periods.	Bid.	Asked.	TARL	Authorized.	Issued.	Due	portode	Rid.	Auto
Albany N. Y.  Date of Quotation—May 14, 1900 The Albany Ry. Co Gen. mtg. 5s. [The Albany Ry. Co Gen. mtg. 5s. [Walervleit Turnpike & RR.1st mtg. 6s] [Watervleit Turnpike & RR.2d mtg. 6s. [Watervleit Turnpike & RR.2d mtg. 6s. [Toy Oity Railway Co	850,000 150,000	427,500 875,000 850,000 150,000	1980 1947 1919 1919 1942	M. & N. M. & N. M. & N.	*1)7½ *117 *125 *128 *116½	1271/ <sub>4</sub> 127	New Orleans La.  Date of Quotation—May 14, 1900.  Canal & Claiborne RE cons mig. 8s. Orescent City RR	5,000,000 416,500 5,000,000 850,000	8,000,000 899,000 2,599,500 850,000 800,000	1899 1948 1908 1948 1907 1912	M. & N. J. & J. J. & D. J. & J. F. & A. J. & J.	105½ 108 112	112
Interest guar, by Albany Ry. Co.  Principal and interest guar, by Albany Ry. Co.	,						134. Charles St. RR. Co1st. mtg. 8s. †\$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds. 1\$90,000 outstanding.  New York	800,000	75,000	1906	J. & D.		
Date of Quotation—May 14, 1900							Date of Quotation- May 14, 1900	1 700 000	1 500 000	1004	* * *		
United Electric Ry. Colst mtg. g. 4s  Saltimore City Pass. Rylst mtg. g. 5s. Baltimore Traction Colst mtg. 5s. Baltimore Trac. Co. Exten. & Imp. g. 6s. Bal. Trac. Co. No. Balto div. lst mtg. g. 5s. Bal. Trac. Co. Coll. Trust, lst mtg. g. 5s. Baltimore Traction Co. Convertible 5s. Central Pass. Ry. Colst mtg. 6s. Central Pass. Ry. Colst mtg. g. 5s. City & Suburban Rylst mtg. g. 5s. Lake Roland Elev.,lst mtg. 5s.	2,000,000 1,500,000 1,250,000 1,750,000 750,000 800,000 96,000 604,000 8,000,000	18,000,000 1,500,000 1,250,000 1,750,000 1,750,000 1,750,000 580,000 8,000,000 1,000,000	1949 1911 1929 1901 1942 1900 1906 1912 1982	J. & D. M. & N. M. & N. M. & S. J. & D. J. & J. N. & M. J. & J. M. & N. J. & D.	102 743/4 1187/8 119 1041/4 121 101 1021/4  119 116 117	102¼ 75 120  121½  121 117	Atlantic Ave. (Brooklyn) Imp. g. 5s. Atlantic Av. (Brooklyn). Istgen. mig.5s. tAtlantic Av. (Brooklyn) Cons. mig. 5s. 1Bro'dway & 7th Ave. 1st cons. mig. g. 5s. Broadway & 7th Ave. 1st mig. 5s. Broadway & 7th Ave. 2d mig. 5s. Broadway Surface. 1st mig. 5s. Broadway Surface. 2d mig. 5s. Brooklyn City & Newtown lst mig. 5s. Brooklyn City & Newtown lst mig. 5s. Brooklyn Bath & W.E. RE. Gen. mig. 5s. Brooklyn Heights RR. 1st. mig. 5s. Brooklyn, Q's Co. & Sub'n 1st mig. 5s. Brooklyn, Q's Co. & Sub'n 1st cons. 5s.	759,000 8,000,000 12,500,000 1,500,000 500,000 1,125,000 1,000,000 6,000,000 2,000,000 1,000,000 250,000 8,500,000	1,966.000 7,650.000 1,500,000 500,000 1,125,000 1,000,000 6,000,000 2,000,000	1909 1981 1948 1904 1914 1924 1905 1941 1989 1988 1941 1941	M. & 8, A. & O, J. & D, J. & J, J. & J, J. & J, J. & J, J. & J, J. & J, J. & J,	95 107½ 115 128 104 108 115 105 116 115 101 101 104 112	110 116 125 108 110 110 110 110 110
All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.  Boston, Mass.  Date of Quotation—May 14, 1900.  Lynn & Boston RR	. 5,879,000	8,702,000 8,000,000	1000	J. & D. M.& N.	114 104½	115 106	Brooklyn Rapid Transit	7,000.000 700,000 1,200,000 250,000 800,000 1,000,000 100,000	5,181,000 700,000 1,200,000 250,000 800,000	1945 1900 1902 1922 1908 1982 1914 1914	J. & D. M. & N. J. & J. J. & D. F. & A. F. & A.	109% 101% 107 125 101 117 102 108	100 100 100 120 100
West End Street RyDeben. g. 5s West End Street RyDeben. g. 4½s #\$1,674,000 in escrow to retire outstand ing bonds of absorbed companies.  Charleston S. C.	2,000,000	2,000,000	4044	M. & S.			42d St., Man. & St. N. Av2d mtg. Inc. 6s. Lex. Ave. & Pav. Ferry RR.1st mtg. k.5s. Metropolitan St Ry Cog. m. cl. tr. g. 5s Second Avenue Ry Gen. cons. mtg. 5s. Second Avenue Ry	1,500,000 5,000,000 12,500,000 1,600,000 800,000	1,500,000 5,000,000 1°,500,000 1,600 000 300,000	1915 1993 1997 1909 1909	J. & J. M. & S. F. & A. M. & N. J. & J.	89 124 120 120 178%	12
Bate of Quotation-May 14, 1900.	F00 000	48.000	1906	J. & J.			Steinway Ry. (L. I.)lst mtg. g. 6s. South Ferry RR. Colst mtg. 5s.	850,000	1,500,000 850,000 5,000,000	1919		116	11: 11: 12:
Enterprise Street RR	850,000	47,000		J. & J.	106		Third Avenue RR	150,000	150,000	1909 1906	J. & J. J. & J.	106	10
Chicago III.						ļ	Union (Huckleberry) Ry1st mtg. 5s. !!Westchester Electric RR1st mtg. 5s.   #81,085,000 in escrow to retire gen. mtg.	500,000	2,000,000 500,000	1942	F. & A J. & J.	118 110	11
Date of Quotation—May 14, 1900 Ohicago City Ry	400,000 1,000,000 7,500,000 1,500,000 4,040,000 7,574,000 15,000,000 8,171,000 500,000 2,500,000 4,100,000 2,700,000 12,500,000	500,000 7,500,000 750,000 4,040,000 8,781,200 15,000,000 500,000 500,000 2,500,000 8,969,000	1908 1929 1929 1907 1982 1928 1942 1906 1911 1900 1927 1928 1911	F. & A. J. & D. A. & O. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. M. & N. J. & D.	1013/4  1081/4  96 106  108  101 1065/8	2½ 102  109  109  111 102 107	bonds.  134.850,000 in escrow to retire maturing obligations.  13552,000 in escrow to retire lat and 2d mig. bonds.  21n treasury, \$80,000.  12 Guar. by Union Ry. Oo.  TOPONTO CAPACIA.  Date of Quotation—May 14, 1900.  Montreal St. Ry	2.500.000	800,000 2,200,000	1908 1921	M. & S. M & S.		;
†Redeemable at option on 60 da. notice iFunded debt assumed by Chicago W. blv. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. lo., lessee. Subject to call after Oct. 1, 1899, at 110 and interest.   Assumed by W. Chi. RR. Co., lessee.   Int. guar. by W. Chicago St. RR. Co.   Cincinnati, O.   Date of Quotation—May 14, 1900							Date of Quotation—May 14 1100	800,000 100,000 150,000 250,000 500,000 1,125,000 5,698,210 200,000 1,800,000	250,000 458,000 867,000 200,000 1,018,000	1900 1898 1901 1905 1911 1912 1948 1910 1917	J. & J. J. & J. M. & S. J. & . F. & A. & O		
Nn. New, & Cov.St. Ry. Ist Con.mtg. g.5. Mt. Adams & Eden P'k InIst mtg. 6s Mt. Adams & Eden P'k InIst mtg. 6s Mt. Adams & Eden P'k InIst mtg. 6s Mt. Adams & Eden P'k Inc. Cons. mtg. 5s O. Cov. & Cin. St. Ry2d mtg. 6s So. Cov. & Cin. St. Ry2d mtg. 6s † Assumed by the Cincin. St. Ry. Co. [\$250,000 reserved to retire 1st mtg. bds	1. 100,000 8 581,090 1. 250,000 1. 400,000	100,000 581,000 250,000	1900 1905 1906 1912	J. & J. A. & O. A. & O. M. & S. M. & S. J. & J.	118 1/4 108 1/4 108 3/4 12 1/4 182 3/4	1141/4 104  1221/4 187	Union Passenger Ry	29,785,000 250,000 750,000	29,724,876	1945 1905 1906			
Cleveland, O.  Date of Quotation- May 14 1800  Brooklyn Street RR. Colst mtg. 6s Cin. New't & Cov. St. RyCons. mtg. 5s Cleveland City Cable Rylst. mtg. 5s Cleveland Electric Ry. Co. 1st mtg. g. 5s Columbus (O.) Cent. Rylst mtg. g. 5s Bast Cleveland RRlst mtg. 5s Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s St. Ry. Co., Grand Rapidslst mtg. 6s St. Ry. Co., Grand Rapidslst mtg. 5s - \$1,900,000 in escrow to retire bonds of absorbed companies, marked a.  [Interest guar. by Cons. St. Ry. Co.	- 8,000,000 - 2,000,000 - 8,500,000 - 1,500,000 - 1,000,000 - 600,000 - 600,000	2,500,000 2,000,000 1,249,000 1,500,000 1,000,000	1922 1909 1918 1918 1910 1922 1915	J. & J. M. & S. M. & N.	1061/4 1181/4 1051/4 106	107 114 × 106 107 	Date of Quotation—May 14 1900.  Birmingham, Knox & Allentown	875,000 1,250,000 1,500,000 50,000 1,250,000 250,000 750,000 1,500,000 500,000	875,000 1,250,000 1,500,000 50,000 1,250,000 250,000 750,000 1,500,000 1,500,000 1,400,000	1980 1927 1980 1918 1942 1928 1924 1927 1929 1922 1980	A. & O. J. & J. J. & J. J. & J. M. & N. J. & J. A. & O. M. & N. J. & J.	1111/4	113
Date of Quotation—May 14 1800. Detroit Citizens' St. Ry1st mtg. 5s. 7t. Wayne & Belle Isle Ry1st mtg. 5s. 7the Detroit Ry1st mtg. 5s. †\$1,150,000 in escrow to retire bonds of the County of the County Ry. and Grand River St. Ry.	1,800,000	8,885,000 877,000 1,800,000	1902	A. & O.	105	102%	Providence R. I.  Date of Quotation- May 14, 1900  Newport Street By	50,000		1910	J. & D.	116	ïı
New Haven Conn.  Date of Quotation—May 14 1100.  New Haven St. Ry1st mtg. g. 5s.  New Haven (Edgewood Div.)lst.mtg.5s.  Winchester Avenue RR—lst mtg. g. 5s.  t heeter Avenue RRDeben. g. 5s.	250,000	250,000	1914 1912	M&S J&D M&N M&S	111 111 109		St. Louis.  Date of Quotation—May 14, 1900  Baden & St. Louis RR	1.600.000	250,000 1,600,000 1,500,000 000 000	1912 1907	J&J	100 102 109 117	10 10 10 11

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PASSE	VGER I	RAILW	AY			
	Amo	unt.		Interest		
NAME.	Authorized.	Issued.	Due	periods.	Bid.	Asked.
St. Louis.	1				-	
Date of Quotation—May 14, 1100,  Jafferson Avenue By	400,000	400,000	1906	M. & N.	108	105
Lindell Ry. Colst mig. 5s Missouri RB. Co	1,000,000	1,500.000	1910	F. & A. M. & S.	108 105	109
tMound City BR. Colst mtg. 6s. People's RB. Colst mtg. 6s.	125,000	800,000 125,000	1910 1902 1902	A. & O. J. & D.	100	102
People's RR. CoCons. mtg. 7s.	1,000,000	75.000 800,000	1904	J. & J.		
St. Louis & E. St. L. Electric. 1st mtg. 6s. St. Louis BR. Co	75,000 2,000,000 2,000,000	75,000 2,000,000 1,400,000		J. & J. M. & N. F. & A.	100   99 <del> </del>     108	101 100 % 104
18t. Louis & Sub. Ry	800,000	800,000 500,000	1909		80 106	84 108
Taylor Avenue St. Rylst mtg. g. 6s. Union Depot RB. Colst cons. mtg. 6s.	500,000 1,091,000	500,000 1,091,000	1918	J. & J.	116 100	118 100%
Union Depot RR. CoCons. mig. 6s. tOontrolled by St. Louis RR. Co.		1,787,000			121	122
Controlled by Union Depot BR. Co. Controlled by Lindell BR. Co.	!					
[\$200,000 in escrow to retire lat & 2d		ļ	ļ			
mig. 2500,000 in secrow. 11\$200,000 in secrow to retire 1st mig.						
ods. San Francisco Cal.						
Date of Quotation-May, 1900. California St. Cable BBlst mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
Ferries & Cliff House Bylst mtg. 6s. Geary St., Park & Ocean BBlst. mtg. 5s.	650,000 1,000,000	650,000	1914 1921	M. & S.	*****	95
t Metropolitan By. Co1st mtg. g. os.	200,000		1918	J. & J.	1263	
†Omnibus Cable Colst mig. 6s. †Park & Cliff House BBlst mig. 6s.	2,000,000 850,000		1918 1912	J. & J.	126 % 105 %	107
Park & Ocean BBlst mtg. 6s.	250,000 700,000	700,000	1914	M. & S.	115	125
tutter St. Ry. Colst mtg. g. 5s. †Controlled by Market St. Ry. Co.	1,000,000	900,000	1918	M. & N.	••••	•••••
Washington D. C.  Date of Quotation—May 14, 1900						
Bell By Co	500,000 500,000	450,000 500,000	1920 1914		182	• • • •
Eckington & Soldiers' Home, 'a' mtg. 6s. Metropolitan BB. CoColl. tr. cons. 6s.	200,000 500,000		1911 1 <b>90</b> 1	J. & D.		•••••
†\$50,000 in escrow to retire 1st mtg.bds. Miscellaneous.						•
Date of Quotation- May 14, 1500.						
Bridgeport Traction Colst mtg. 5s. Buffalo (N. Y.) By. CoCons. mtg. 5s.	2,000,000 5,000,000	1,688,000 8,548,000	1931		108 118	110
'( 'tizens' St. E. (Ind'polis).1st cons.m.5s l'Orosstown St. Ry. (Buffalo).1st. mtg.5s.	4,000,000 8,000,000	8,000,000 2,866,000	1932	M. & N. M. & N.	104 112	103 118
Columbus (O.) St. Bylst cons. g. 5s. Consolidated Traction (N. J.)lst mtg.5s.	8,000,000 15,000,000	2,261,000 18,965,000	1938	J. & J. J. & D.	115 1114	1113/8
Orosst'n St. Ry. (Colu's, O.)lst mtg.g.5s Denver Oity Cable Rylst mtg. g. 6s. Denver Con. Tram'y CoCon. m. g. 5s.	2,000,000 4,000,000 4,000,000	572,000 8,800,000 922,000	1920	J. & D. J. & J.	115 20	115%
Louisville (Ky.) Rylst cons. mtg. g.5s. iMinneapolis St. Rylst cons. mtg. g. 5s	6,000,000 5,000,000	4,981,000 4,050,000	1930	A. & O. J. & J. J. & J.	80 119 1101/4	85 119% 110%
Tho. Hudson Co.Ry. (N.J.). Cons. mtg. 5s	8,000,000 550,000	2,878,000 550,000	1928	J. & J. M. & N.	108	
No. Hudson Co. Ry. (N. J.)Deb. 68. Paterson (N. J.) RyCons. mtg. g. 68.	500,000 1,250,000	439,000 1,000,000	1902 1981	F. & A. J. & D.	••••	•••••
Kochester (N. Y.) Rylst mtg. 5s. St. Paul City RyCons. g. 5s.	8,000,000 5,500,000	2,000,000 4,298,000	1937	A. & O.	105%	106
St. Paul Oity By	1,000,000	1,900,000	1900	•••••	108	••••
†\$1,000,000 in escrow to retire 1st and d mtg. bds. †\$800,000 in treasury. Bonds guar. by						
Buffalo Ry. Co.  78760,000 in secrow to retire bonds of						
.C. St. RR. Co. 1187.000 in treasury.						
\$8960,000 res'ved to redeem prior liens.						
	5.5.5	07016			With i	
ELEOTRIO LIGHT AND Boston, Mass.	J ELE	O I KIC	AL	. MF	<b>J.</b> C	<u>os,</u>
Date of Quotation-May 14 1900.	800.000	900 000			106	•
Delaware Gas Lt. Co.,	800,000 2,025,000	8,750,000	1922	J. & J. Quar.	157 116	••••
Jeneral Electric Cogold coup, deb. 5s Pittsburg Pa	10,000,000	8,700,000	1322	********	110	•••••
Date of Quotation— May 14, 1900 Allegheny County Light Co	500,000		1911	J. & J.	110	*****
Westinghouse Elec. & Mig. Co. Scrip 5s.	195,570	•••••		M. & S.	••••	*****
Miscellaneous.—(May 14 1900.) Etison El. Ilig. Co. (N. York) lst m. 5s Etison El. Ilig. Co. (N. Y.) con. m. g. 5s.	4,812,000		1910		109	•••••
E iison El. Illg. Co. (N. Y.) con. m. g. 5s. E iison Elec. Illg. Co. (Brooklyn) E iison Electric Light (Philadelphia)	15,000,000 5,000,000		1993 1940	******	124 1221/4	124
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,000,000 2,500,000		1937	A. & O.	100	101
Kings Oo, El, Lt. & Po. Co. pur. money 6s Milwaukee El, Ry & Lt. Co. lst con. g. 5s. United Elec, Light & Power Co(N. Y.)	5,176,000 8,000,000 5,000,000	6,103,0	1997	A & O. F. & A.	120 1023	122
TELEPHONE		TELEG		APH.	•••• 1	••••
Miscellaneous.			Ī			
Date of Quotation - May 14 1900 American Bell Telephone			1908	F. & A.	100½	101
NorthwesternTelegraph Co	******				114	115
Chesapeake & Potomac Teleph. Co5e.			1911	J. & D.	108	106
ALLIED	INDUS	STRIE	s.		<del></del>	
Miscellaneous.  Date of Quotation—May 14, 1900						
American Electric Heating7s. Armington & Sims Engine Co	<b>500,00</b> 0	\$00,000		********	••••	25
Barney & Smith Car Co			1942 1904	J. & J J & D.	106	107
Worthington Pump Co	75,000 l	••••••	·(	••••••	115	127

# NOTES FOR INVESTORS.

Late quotations for copper are : Electrolytic,  $16\frac{3}{2}$  @ $16\frac{1}{6}$  1.; Lake,  $16\frac{3}{6}$  @17c.; casting,  $16\frac{1}{6}$  @ $16\frac{3}{6}c$ .

The stockholders of the Donver Gas & Electric Company held their annual meeting in Danver on May 8 and re-elected the retiring directors. The financial statement for the year has not been received.

The latest quotations for some of the new industrial stocks, not given elsewhere are: Electric Boat, 17@20; New York Electric Vehicle Transportation, 8½@9½; New England Transportation, 4@42; Gramophone, 45@59.

The Logansport, Bochester and Northern Traction Company of Logansport Ind., has filed a \$4,000,000 mortgage in favor of the Mercantile Trust Company of New York. The money is needed to equip a line from Logansport to Kendalville.

The annual stockholders' meeting of the Erie Telegraph and Telephone Company will be held June 12 in New York. Stockholders will be asked to consider and act upon the question of increasing the number of directors from 12 to 25.

The earnings of the Third Avenue Bailroad Company for March, as reported by the receiver are \$184,288; net \$67.211; surplus \$33.827; 42nd Street, Manhattanville and St. Nicholas Ave. March 19 to 31, earnings \$16,573; net \$1,097; deficit \$2,976.

Earnings of the Manhattan Elevated Railroad Company of New York for the quarter ended March 31 show: Gross, \$2,401,176: operating expenses, \$1.321,694; net, \$1.079,582; other income, \$202,363; total, \$1,281,945; charges, \$656,392; surplus, \$025,553.

To pay for extensions and improvements the Portsmouth Street Railway Company of Portsmouth, Va., has executed a mortgage on part of its extensive property to secure the Colonial Trust Company, of Philadelphia, for \$100,000 of twenty-year bonds.

Owing to default of the City of Austin, Texas, 5 per ceut. waterworks and electric light bonds, a committee has been formed for mutual protection and asks holders to communicate with the New York Security & Trust Co., or the Mississippi Valley Trust Co., of St. Louis.

The statement of the Utica Electric Light and Power Company for the year ended December 31, shows: Gross earnings, \$118,700; operating expenses, \$68,212; net earnings, \$59,488; add net earnings as se and repair department, \$8,000, total net earnings, \$58,488 ; interest on bonds, \$25,000; aurplus, \$33,488.

The Canton-Massillon (O.) Electric Railway Co. has increased its capital stock from % 0,000 to 1,000,000. The increase, which is to be met with an issue of bonds, was necessitated by the extensive improvements which the company has in contemplation for the coming summer, some of which are already under way.

The governing committee of the New York Stock Exchange has adopted resolutions, to take effect June 1, 1930, restricting the use of private telephones and telegraph wires connecting offices of members with offices of non-members, and placing such wires under control of the committee of arrangement.

The North Jersey Street Railway Company, which controls nearly all the trolley lines in Northern New Jersey, has been negotiating with the Hudson River Tunnel Company, with a view to running its trolley lines from Fifteenth street, Jersey City, under the North River to Morton street, New York, and there connect with the Metropolitan Street Railway Company lines.

The latest report from the New England Electric Vehicle Transportation Company shows that there are now in operation in Boston between 50 and 60 electric cabs and 15 electric delivery wagons. The company recently reduced its capital stock from \$25,000,000 to \$5,000,000 and the par value of shares was reduced from \$100 to \$10. This action makes all the shares now outstanding full paid and non-assessable. The directors of the company are George von L. Meyer, Oliver Ames, Francis R. Hart, Martin Maloney. Charles L. Edgar, Frederick A. Gilbert, Colonel A. A. Pope, James E. Hayes and Robert McA. Lloyd.

The Boston "News Bureau" says: "The purchase has been consummated of the South Shore and Boston Street Rillway Company by the Massachusetts electric Companies on terms advantageous to the latter. The South Shore and Boston Company is a consolidation of five South Shore roads: The Hingham, Hanover, Braintree and Weymouth, Bockland and Abington companies and one other. It is considered probable that the new properties are taken over through an exchange of stock. The Massachusetts Electric Companies is well off in cash. It is understood to have \$800,000 on hand. Earnings of 2 per cent on the common stock are looked for for the fiscal year ending with June."

The Mexican Telephone Company reports for the year ended February 28: Gross revenue (Mexican currency), \$163,649, increase, \$21,702; expenses, \$93,251: increase, \$10,754; net revenue, \$67,389; increase \$10,948. The report says that in the city of Mexico about 50 per cent. of the subscribers are now supplied with long-distance instruments, as compared with 20 per cent. at the beginning of the year. The year closed with 71 new subscribers to be connected. At the annual meeting of the stock holders the retiring directors were re elected, except that W. C. Carson of New York and Olis Kimball and Charles H. Bollins of Boston were elected to succeed Robert Colgate, James H. Dawes and Godfrey Moise, respectively.

The directors of the Third Avenue Railroad Company, New York City, met at the effices of the company, at 67.h street and Third avenue, on May 11, and approved of the form of the bond for \$50,000,000 for improvement of the road. Immediately after the meeting of the directors there was a meeting of the stockholders to approve of the bond issue. The law requires that two-thirds of the stockholders shall approve of the issue of bonds of a corporation. The mortgage securing the present issue covers the entire property and franchise of the company, and is made to the Morton Trust Company as trustee. The bonds are to become due in the year 2900 and are to bear interest at four per cent from May 1, 1900.

As stated in the last issue of ELECTRICITY the New England Telephone and Telegraph Company decided to increase its capital stock from \$15,000,000 to \$20,000,000. This increased capital will be used from time to time to meet the demands of the business in the way of new extensions. The company expends on an average \$1,500,000 per year in the extension of its business, and in the past new money has been derived by the sale of both bonds and stock. During 1899 the company issued \$1,783,000 of new stock of which \$983,000 was used for new construction and \$800,000 for account of the Southern Massachusetts Telephone Company. \$1,000,000 4 per cent. debenture bonds were also issued of which part were used to redeem \$500,000 6 per cent. bonds and the balance in new construction.

\$500,000 6 per cent. bonds and the balance in new construction.

The N. Y. "Times" says: "A new consolidation of copper properties is soon to come into the field. It will take over a number of Mexican and United States copper mines and be known probably as the Pan-American Copper Syndicate Company. The aggregate capitalization of the companies to be merged is over \$70,000,000 and the new corporation which takes them all in will be capitalized at only \$15,000,000,000 It is intended shortly to apply to have the stock listed here and on the London Exchange. The Mexican properties include among others, the San Luis mine, at Durango. Mex., the San Luis mine at Chihuahua, Mex., the San Anitie and the San Pedro of San Pablo. One of the American companies to be absorbed is the Arizona Eastern & Montana Co. which has mines at Tombstone, Cochise, and Mayer, Ariz., and runs a smelter at Bigbug Postoffice, Ariz., which it leases from the old Commercial Mining Co., controlled by Phelps, Dodge & Co. of this city.



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No. 20.

# FLECTRICITY

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# EDITORIAL NOTES.

The National Electric Light Convention.

As we go to press the Twenty-third Convention of the National Electric Light Association is about to be held

in Chicago. Everything has been made ready by the gentlemen having the arrangements in charge so that the delegates may be sure of spending as enjoyable and profitable a three days in the Windy City as was the case in 1898. A glance at the programme of the Convention, which will be found elsewhere in this issue, reveals the fact that the papers to be presented are on topics of unusual interest, which should ensure full and interesting discussions. Among other things the question of municipal ownership of electric lighting plants will be touched upon, and a report will be made regarding the progress of the investigation of municipal plants, and plans formulated for the continuance of the work.

The entertainment committee has put forth unusual efforts to make the stay of the visiting ladies enjoyable, and with that end in view arranged for a reception to be held on Monday evening at the Auditorium parlors, for an automobile ride for the ladies on Tuesday morning, with luncheon at the Washington Park Club; on Wednesday, a shopping tour in the morning and a matinée in the afternoon; on Thursday the Art Institute and Public Library will be visited in the morning, and a matinée in the afternoon.

Altogether the Twenty-third meeting of the Association promises to be one of the most instructive and enjoyable yet held.

\* \* #

The Gas Engine as a Competitor of Steam.

During the past few years, the gas engine has been coming more and more into use as a prime mover in elec-

tric light and power stations. This has been partly due to the fact that gas engine manufacturers have been turning out machines of constantly greater power, and that while a five or ten horse power engine was the limit a few years ago, to-day efficient gas engines of many times that power may be obtained. Another cause, aside from any question of economy, which has helped to create a demand for this type of prime mover, is that a machine of this description requires far less space than a

steam engine with its accompanying boiler, condenser, feed water heater, etc., which is a fact well worth considering where land is expensive and it is a question of economizing in construction.

Another advantage to be derived by the use of gas engines in connection with electric generating stations, especially those situated in thickly populated districts, is that coal and ashes do not have to be carted and carried away from the stations, and the only water necessary is that utilized in cooling the engine cylinders.

Referring to the efficiency of the gas engine as compared to the steam engine in the "Engineering Magazine" for April, Mr. A. D. Adams says:

"The best steam engines do not change more than 15 per cent. of the heat supplied them into mechanical energy, and boilers rarely give over 80 per cent. efficiency. Gas engines will return 20 and even 25 per cent. The combined efficiency of steam engine and boiler is at best 12 per cent., which may be assumed as about equivalent to 1.63 lbs. of anthracite of 13,000 B.T.U. capacity per pound. Coalgas, and water gas are not recommended for power purposes. Coal gas only contains 25 per cent. of the energy of the coal from which it is made, while water gas contains about 60 per cent. Hence the combined efficiency of coal gas plant and gas engines is only 6.25 per cent., and that of water gas about 15 per cent. Producer gas contains as much as 80 per cent. of the calorific capacity of the fuel it is made from, and the cost of apparatus exceeds by very little that of boiler plant for equal power. The combined efficiency of producers and engines may thus be 20 per cent. With the same anthracite as above, the horse-power-hour may be obtained with 0.98 lb. of fuel, as against 1.63 lbs. with steam engines. The fuel saving is nearly 40 per cent."

There are, however, other advantages besides those already mentioned. For instance, producer gas can be made from fuels of a quality too poor for steam raising purposes.

Mr. Adams considers that electric stations have peculiarities rendering them particularly suited for gas power. The load, for example, susually ranges from a fourth to a half of the maximum load, and the changes are rapid, and ordinarily, load may vary from average to maximum in one hour, while maximum load rarely endures for two hours in twenty-four—this of course refers to lighting stations. The result

of all this is not merely that there must be sufficient engine power to carry the maximum load, but that the boilers also must be of the same full power. With producer gas, however, a cheap form of gas-holder will enable the gas-producer to be run steadily, and the peak of the load curve will be dealt with by the stored gas. Storage batteries, of course, have been applied to steam-driven stations, to get over the peaks of the loads, but the storage battery is equally applicable to gas-driven stations, and still leaves the above further advantage.

In Europe gas engines are employed even more extensively than in this country for the direct driving of electric generators, which may be in part attributed to the conservative and non-committal stand that our gas engine manufacturers took some four years ago, when this type of prime mover was first beginning to compete with steam. Since then, however, conditions and opinions have undergone a material change, with the result that the gas engine of to-day is unquestionably a serious competitor of the invention of the illustrious Watt.

The Equipping of Trolley Cars With Up-to-Date Brakes. In a city such as Greater New York, where on almost every principal thoroughfare electric street

car lines are to be found, accidents to pedestrians are inevitable. But it does not necessarily follow that because accidents are bound to occur that no means should be taken to reduce the number to a minimum by the use of proper electrical and mechanical appliances. Almost every issue of the daily papers contain accounts of injuries of a more or less serious nature sustained by inhabitants of this city, owing principally to the inability of motormen to control the ponderous cars that are coming more and more into use. Where an electrically-propelled car weighs ten or twelve tons, and is running at a speed of seven or eight miles an hour, it is about as reasonable to expect to bring it to a standstill within a few yards in case of an emergency by the hand brakes now generally in use, as it would be to stop the Empire State Express with the braking appliances in vogue twenty years ago. And yet the majority of street railway companies cling through parsimony or conservatism to a type of brake that indirectly causes them an outlay of thousands of dollars annually in damages and lawyers' fees.

Last September, as will be recalled, this question was taken up by the New York State Railroad Commission. A number of different types of brakes were tested on cars which were run on a stretch of track belonging to the Metropolitan Street Railway Company in this city, and it was hoped that the information and results obtained by these trials would warrant the commissioners in recommending some braking appliance that would appeal to the various railway companies. Like many other good things, however, the tests started out with a great blare of trumpets only to end in a pitiful wail, for as nearly as can be ascertained outside of obtaining a certain amount of information and data, which is probably lying in a dusty pigeon-hole at Albany, nothing tangible has resulted, and the cars of the Metropolitan system are still equipped with slow-acting brakes.

In this connection it is interesting to note that two of the Brooklyn roads are waking up, the management evidently proposing if possible to stop the trolley car slaughter that has been going on for some time past in that borough. According to the Brooklyn "Eagle," it is probable that before any great period of time elapses the surface cars of the Brooklyn Rapid Transit Company and those of the Coney Island and Brooklyn Railroad Company will be equipped with a new and improved type of brake. This is to be inferred from the fact that these two companies have been experimenting with various types of braking apparatus. One type especially is said to have proved exceedingly satisfactory, so much so that an order for the equipment of one hundred trolley cars has recently been placed. The brake adopted consists of a simple friction device placed on the car axle, to which is attached a chain, which is connected to the sway bar of the ordinary brake rigging. The friction disk on the axle, which winds up the brake chain, is quite heavy, and when a car is moving rapidly, and an emergency stop is required, the friction surfaces are pressed together. This causes the disk to rotate on the axle, and when it is moved far enough to pull the shoes against the wheels it has attained a high velocity of rotation. As in the Sperry brake the pressure is greatest at first, which is automatically and gradually reduced as the car slackens its speed.

As previously stated in these columns there is no great difficulty in finding a quick-acting brake suitable for overhead and underground trolley cars, as there are a number of such brakes already on the market. Where the trouble does lie, however, is in making the management of the various street railway companies, see the necessity of changing their braking appliances, and if they stand in their own light, and insist on adhering to more or less antiquated methods, drastic measures should be adopted by the proper authorities in the interest of the public.

\* \*

The Philadelphia Meeting of the American Institute of Electrical Engineers. The Seventeenth General Meeting of the American Institute of Electrical Engineers was held at the

Drexel Institute in Philadelphia on May 16, 17, and 18. This was the third meeting of the Institute that has been held in that city, the first taking place during the period of the International Electrical Exhibition, in 1884, and the second in 1894, under the auspices of the Engineers' Club.

The meeting which drew to a close last week was made conspicuous by the number of interesting papers presented. Special mention should be made of those descriptive of apparatus for testing electric motors, and of the "Percentage Bridge," an instrument for measuring resistance. The subject of "Eddy Current Losses in Transformers" was taken up and discussed at some length by Mr. Steinmetz who disagreed in some respects with the conclusions drawn by the author, Mr. Townsend. Generally speaking, however, the papers treated of practical subjects, which, in our opinion, is always much to be desired.

Among other things a report of the Committee on Units and Standards was made and discussed. It was remarked by one of the speakers that the practical engineer had a hard time of it between the pure scientists, with their new definitions and units of measurement, and the practical men, who held on to the old terms and forms of expression. It compelled him to translate the language of each to

the understanding of the other. This sentiment was heartily applauded. The report was adopted, and instructions were given to have it transmitted to the delegates to the International Congress for presentation at its meeting in Paris

The social features of the meeting were everything that could be desired, the delegates having an opportunity of visiting Cramps' ship-yard, which was followed by a planked shad dinner at Washington Park. The ladies of the party had several enjoyable sails on the Delaware, and on Wednesday afternoon took in a matinée.

# UNDER THE SEARCHLIGHT.

#### Notes and Comments on Various Topics.

In the State of Pennsylvania an electric railway mail route is to be established between Bristol and Doylestown.

Work on the transcontinental telephone line is being rushed through Colorado, and communication between Denver and Ogden will, it is claimed, be opened in September.

The distance record for electric carriages without recharging was beaten last week on the Paris-Dijon road, M. Garcin covering 262 kilometers (nearly 163 miles).

THE Executive Committee of the International Association of Municipal Electricians met in Brooklyn on May 17 and completed arrangements for the holding of the Fifth Annual Convention. This convention will be held in Pittsburg, Pa., on September 25, 26, and 27.

THE latest electric enterprise to make its appearance in Chicago, Ill., is the American Electric Carnival and Gondola Company, which is seeking a right of way for a line of electric boats on the Chicago River and drainage canal.

THE National Gold Reduction Company of Florence, Col., recently started the machinery installed in its plant. A new Corliss condensing engine, 300 horse power, drives a Bullock electric generator, which in turn runs six electric motors at different points in the mill, making the power in the plant practically electric throughout. The capacity of the mill has been increased by 120 tons per day, or 180 tons, as against sixty tons formerly. A Holthoff Wifley roasting furnace with cooler has been added, two sets of sixty-ton rolls, a 125-ton dryer and three fifteen ton chlorination barrels. Everything runs without a hitch anywhere. The National mill is now second in point of size at Florence. One hundred men are now employed against forty heretofore.

R. T. GREENER, United States commercial agent at Vladivostock, writes the State Department at Washington as follows: "Mr. Khikoff, Minister of Ways and Communications, had a special train sent to him on the Great Siberian Railroad some months ago. There were five coaches—one first-class, two second class, one dining, and one baggage car. All the appointments were excellent. There were, besides the usual library, pianos, writing conveniences (found in American cars), a barber shop, a gymnasium, a good supply of ice, patent boilers, dials which indicate the next station and the length of stop, double windows



to protect from dust and the extreme Siberian cold; and an observation car at the rear. On this train were attendants speaking English, French, and German. The cars were lighted throughout by electricity. There was no charge for the barber or for medical attendance. The bath costs \$1. From St. Petersburg to Irkutsk the transit occupies about seven days; from Moscow about six, and from Paris not more than twenty-eight days. The total length of the line to Vladivostock will be 4,714 miles. The cost will be \$400,000,000."

News from Portland, Ore., states that the Columbia Southern Railway Company has made arrangements for the construction of a telegraph line from Biggs to Shaniko. The line will require 5,000 poles and 178 miles of wire, and will be completed about the first of July.

Considerable difference of opinion prevails in regard to the liability of the United States Government for the damages sustained by the Cuba Submarine Telegraph Company during the Spanish-American war. The company has presentented a claim for damages, and the President has sent a message to Congress setting the matter before that body. In the opinion of one of the high officials of the Government, Cuba, and not the United States, is directly responsible for any losses sustained, as the company is a Cuban institution, and if any recompense is made he holds that Cuba should defray the same. The damages arose from the cutting of the cables by the American forces as a war-time precaution.

SEVERAL freight elevators for large warehouses have recently been received at Bahia, Brazil, from the United States, but the demand in this line is limited, because about all of the warehouses have been equipped and no new ones are being built. There is no market for passenger elevators, as there are few buildings of more than three stories, and an utter lack of office buildings as we know them.

THE Chicago authorities are forcing the traction companies to lay grooved rails on the streets of that city, as the only means of preserving pavements, and rendering traffic safe over the tracks. The old-style rails not only make it impossible to pave up to them, but they make it perilous to cross them on either vehicle or bicycle.

ELECTRICITY is to play an important part in recording the census of the United States in the use of the electric tabulating machine, which consists of three main parts, namely, the press or circuit-closing device, the dials or counters, and the sorting boxes. The press consists of a hard rubber plate, provided with 316 holes or pockets, the relative positions of which correspond with those of the holes in the keyboard and gang punches. Each of these pockets is partially filled with mercury, and they are thus in electrical connection when the circuit is closed, with the binding posts and switchboard at the back of the machine. Above the hard rubber plate swings a reciprocating pin box, which is provided with a number of projecting spring-actuated points, so hung as to drop exactly into the center of the little mercury cups below. These pins are so connected that when a punched card is laid on the rubber plate against the guides or stops, and the box is brought down all the pins that are stopped by the unpunched surface will be pressed back, while those that correspond with punched spaces pass through,

close the circuit and count on the dials. The circuit is broken first through platinum contacts at the back of the press. In this way no difficulty is experienced from the oxidation of mercury from the spark, as would be the case without this precaution.

WORK on the Rapid Transit tunnel has begun in earnest at 156th street and Broadway, New York.

It is stated that the automobile industry, though still in its infancy, is being rapidly developed, and is destined to become an important factor in the manufacturing circles of Germany. The large amount of capital and energy that is being expended by German business men upon this industry indicates great confidence in the future of automobilism. In France, where automobiles were first considered seriously, the chief aim has been toward obtaining excellence in sporting and luxurious automobiles, but in Germany a directly opposite state of affairs exists, and the efforts there have been to further the manufacture of freight automobiles for transportation and freight carrying. Electricity and benzine are used almost exclusively as motive powers, and preference is shown for the former. The benzine automobile is more desirable for transporting heavy loads, but the present high price of benzine and the prevalent, though unfounded, fear of explosion of the benzine motor have made the electromobile the favorite.

THE Rev. Minot J. Savage, pastor of the Church of the Messiah in this city, sailed Saturday to make an automobile trip through Southern Europe. The automobile, which has been made for six, has room for luggage. The trip is laid across the Pyrenees into Spain and back to Paris.

F. H. KIRCHNER & Co. began last week to build the conduits for placing the electric wires of the Cincinnati Edison Electric Company under ground. The company will lay 250,000 duct feet or 50 miles of ducts, and will accomplish this big job in less than three months. The ducts are of tile and will be five feet beneath the surface.

SECRETARY GAGE recently transmitted to Congress a communication from Secretary Hitchcock, submitted with his favorable recommendation, an estimate of appropriation of \$53,423 for an electric plant for lighting the buildings occupied by offices of his department, known as the Patent Office, the General Postoffice, and the Pension buildings. specifications and estimate of cost, contemplating the installation of machinery in the General Postoffice building for generating a current for the whole service mentioned, were prepared by Commander George W. Baird, United States Navy, Superintendent of the State, War and Navy Department building. Secretary Hitchcock says: "The attics, basements and cellars of these buildings, where artificial light is constantly required, are filled and crowded to their utmost capacity with files and records, and I direct attention to the danger of the destruction of these valuable archives of the Government from the use of gas among this necessarily closely crowded and inflammable material. This menace would be materially lessened by the substitution of electric lights, and I urgently invite the favorable consideration of the estimate by Congress."

The type of street-car sprinklers which has been in use in Cincinnati for some time will shortly be given a trial in Indianapolis by the Indianapolis Street Railway Company. cars hold several hundred gallons of water or sufficient for one hour's trip at trolley speed.

H. H. VREELAND, president of the Metropolitan Street Railway Company of this city, has contributed to the current number of the "Independent" an article on "The Failure of Municipal Ownership." After asserting that private ownership of street railways is better for the people who ride, and the employes than municipal ownership, Mr. Vreeland cites a recent paper from Benjamin Taylor, F.R.G.S., who says that the experiment in Glasgow is only a limited success, while municipal ownership in other cities is so insignificant as to be unworthy of notice. Continuing, Mr. Vreeland says: "A man may ride eight miles in Glasgow for two pence; here he may ride for the same price fifty miles by means of our system of transfers. In Glasgow there are no transfers; here last year we gave away 148,000,000 of them. Therefore, when a man changes cars in Glasgow he pays a new fare, and travel there is quite likely to be dearer than here. It is true that one may ride half a mile for a half penny, but I don't see that that is any advantage, for if one only wants to go half a mile it is healthier to walk-and in Glasgow quicker."

THE Spalding St. Lawrence Boat Company of Ogdensburg, N. Y., has completed and delivered to Mr. George Bullock of Oyster Bay, N. Y., a 35-foot cabin electric launch, equipped with a 20 horse power motor designed and made by the Bullock Electric Company, of Cincinnati. The steering is done by a separate small motor attached to the rudder post under the stern deck, and managed entirely by two push buttons. The boat is also lighted by electricity. The same boat company is about to deliver to Collector George R. Bidwell, of New York, a 42-foot cabin electric launch, furnished with a motor made by the Electric Launch Company. This launch is of mahogany, and is provided with many new things. She is to be used on the Hudson River.

A saw is being introduced for surgical purposes which is driven by an electric motor. The motor runs at 2,200 revolutions a minute, developing in the neighborhood of one-tenth horse power. It is held in the hand of an assistant by means of a leather strap, so that it can be made to follow the hand of the surgeon who is using the saw. Attached to the motor shaft is a flexible spiral coil incased in a braided sheath. This enables the utmost freedom of movement on the part of the operator, who holds the saw in his right hand. This machine is being used extensively in several large hospitals. Its great value has been manifested in severe operations, where the shock attending the use of the slower-acting hand saw is so likely to prove fatal to the patient.

## Proposals Invited.

The Commissioner of Indian Affairs is inviting sealed proposals until June 4, for furnishing the necessary materials and labor required to construct and complete the electric lighting system at the Indian school at Salem, Ore. Specifications and full details may be obtained upon application to the U.S. Indian warehouse, 235 Johnson street, Chicago, Ill., or to Thos. W. Potter, superintendent of the school.



### THE TWENTY-THIRD CONVENTION OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

The Twenty-third Convention of the National Electric Light Association promises to be one of the most instructive and enjoyable yet held. Every possible arrangement has been made looking to the comfort of the delegates who will gather in Chicago from May 22 to 24 to read papers and discuss topics of interest to electrical engineers in general and central station managers in particular.

As at former conventions special pains have been taken to give the visiting ladies a pleasant time, and with that end in view an automobile ride was planned for Tuesday morning,

comfort of the delegates is composed of the following gentlemen:

Louis A. Ferguson, chairman; B. J. Arnold, C. E. Brown, F. E. Donahue, H. R. Hixson, A. O. Kuehmsted, C. A. Munson, J. B. Wallace, F. B. Badt, F. H. Clark, Edward B. Ellicott, Samuel Insull, W. W. Low, Julian Roe, G. S. Whyte, George C. Bailey, Norman Collins, C. E. Gregory, E. B. Kettle, A. D. Lundy, Thomas I. Stacey, J. R. Wiley, Charles T. Boynton C. D. Crandall, Arthur Hartwell, F. W. Kohler, G. H. McKinlock, B. E. Sunny and James Wolf.

The official programme is as follows:

#### TUESDAY, MAY 22.

Meeting of the Executive Committee at 9 A. M., Secretary's office, Auditorium Hotel.

of Electrical Apparatus, Prof. Francis B. Crocker, chairman.

#### WEDNESDAY, MAY 23.

Morning session, 10 o'clock.

Paper-"Uniform Accounting," Lieutenant James Blake Cahoon, Syracuse, N. Y.

Paper-" Equitable, Uniform and Competitive Rates," Henry L. Doherty, St. Paul, Minn. Afternoon session, 2:30 o'clock.

Paper-"Series Enclosed Alternating Arc Lamps," Prof. William Lispenard Robb, Hartford, Conn.

Report of the Committee on Standard Candle Power of Incandescent Lamps, Dr. Louis Bell, chairman,

Paper-"Combination Electric Lighting,



AUDITORIUM HOTEL, CHICAGO, WHERE THE NATIONAL ELECTRIC LIGHT CONVENTION IS BEING HELD.

with luncheon at the Washington Park Club; on Wednesday morning a shopping tour will be indulged in, followed by a matinée in the afternoon, while on Thursday the Art Institute and Public Library will be visited in the morning and a theater after lunch.

As was the case two years ago, arrangements were made for holding a general reception in the Auditorium parlors on Monday evening, May 21. This custom has much to recommend it, as it furnishes the delegates and ladies accompanying them an opportunity of meeting old friends and making new acquaintances.

The Local Reception and Entertainment Committee which has so ably arranged for the

Morning session, 10 o'clock, Convention Hall, Auditorium Hotel.

Address of President Carnes.

Report of the Committee on Photometric Value of Arc Lamps, Henry L. Doherty, chair-

Report of the Committee on Grounded Circuits, Captain William Brophy, chairman.

Afternoon session, 2 o'clock.

Paper-"Exhaust Steam Heating," Harry J. Frith, Watseka, Ill., and Col. F. A. Copeland, La Crosse, Wis.

Paper—"Central Station Economies," W. L. Abbott, Chicago.

Report of the Committee on Standardization

Power and Railway Work," R. S. Feicht, Pittsburg, Pa.

Executive session.

Evening session, 8 o'clock, Auditorium Hall. Paper-"Alternating Current Generators," illustrated with stereopticon, H. G. Reist, Schenectady, N. Y.

THURSDAY, MAY 24.

Morning session, 10 o'clock. Paper—"Automobiles as a Source of Revenue to Central Stations," Elmer A. Sperry, Cleveland.

Report of the Committee on Amendments to Freight Classification, James I. Ayer, chair-



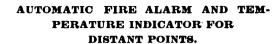
Topic—"Free Wiring." Discussion by Chas. R. Huntley, of Buffalo, N.Y.; E L. Bemiss, of New Orleans, La., and Dudley Farrand, of Newak, N. J.

Afternoon session, 2:30 o'clock.

Report of the Committee on Legislative Policy," Samuel Insull, chairman.

#### A HIGH VOLTAGE LONG DISTANCE; TRANSMISSION PLANT.

Considerable interest is being manifested throughout the United States over the practical results of the transmission of the electric current of the Standard Electric Company, in operation early next year if all goes well. The main trunk for transmission will be about 150 miles in length with numerous branches. The Standard Electric Company has expended nearly \$2,000,000 in this enterprise.



(Translated for Electricity, from "La Vie Scientifique," Paris, France.)

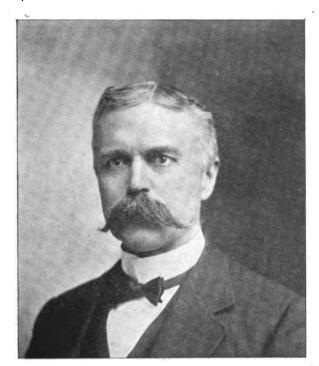
An invention of M. J. Vila y Forns of Gerona, Spain, to act as an automatic fire alarm in combination with a temperature indicator for distant locations will not fail to attract attention from the simplicity and ingenuity of its construction.

The essential parts of the apparatus consist of a thermometer having platinum electric conducting wires inserted in the stem, at distances of five degrees apart, and arranged in such a manner that the mercury touches the respective extremities of the platinum wires at the indicated degrees of temperature.

All the wires are brought to an indicating switchboard, which contains contact buttons corresponding in number to the platinum points inserted in the thermometer tube, and arranged in a semi-circle.

Each button is labeled with the number of degrees of temperature with which it is connected at the thermometer tube.

In the center of this semi-circle is pivoted an



S. T. CARNES,
President of the National Electric Light Association.

Report of the Committee on Theft of Current, James I. Ayer, chairman.

Executive session.

Reports of the Secretary and Treasurer and Executive Committee.

Election of officers.

Insignia—Officers, red bow; Executive Com-



GEORGE F. PORTER,
Secretary and Treasurer of the National Electric
Light Association.

mittee, blue bow; active members, dark green ribbon; associate members, light green ribbon; Reception Committee, yellow ribbon; guests, mauve ribbon; honorary members, white ribbon.

The Haugh-Noelke Iron Works of Indianapo is Ind., was recently awarded the contract for the construction of the Agnes avenue viaduct by the Metropolitan Street Railway Company of Kansas City, Mo. The structure will require steel weighing 13,000,000 pounds and will be built without interfering with traffic on the viaduct that is now in use. The contractors agree to complete the work by September 1.

of which Prince Poniatowski is president, from the generating plant at the foot of the Sierra Nevada Mountains to San Francisco and the neighboring cities and towns. The reason is that the voltage will be the highest in the country, and the commercial transmission the longest of any in the world. There are many very interesting details associated with this work, the most striking, however, being in connection with the insulators, which are of a new and complicated system. The electric current will be transmitted from the power house of the Standard Company, two miles east of the county road between Jackson in Amador County and Mokelumne Hill in Calaveras County, by means of aluminum cables threequarters of an inch in thickness, composed of thirty-seven wires laid one over the other in a series of twists in opposite directions, and then bound together. The service of carrying 60,000 volts to be imposed upon them is something unexampled, and therefore the tests to which they have been subjected are extraordinary. The tests proved entirely satisfactory. sustaining sixteen times the pressure to which they will be put in actual transmissions. The transmission system will consist of two cross sections. The first installation will be from the power house along the mother lode for the use of the mines and mining towns, thence to the power house in Stockton, from that place to the Mission San Jose, to Oakland, from the Mission San Jose to Alviso, and to South San Francisco. The line from Alviso along the west side of the bay to South San Francisco will be exploited by another company to which the current will be supplied by the Standard Electric Company. It is expected that this section of the work will be in operation by next July. The second installation will be to San Francisco, and will be placed

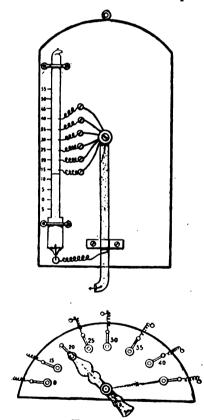


DIAGRAM OF TEMPERATURE INDICATOR APPARATUS.

indicating switch-arm, as shown in the illustration, and so arranged that its extremity can come in contact with each of the buttons when turned on its pivot. A wire connects this switch arm with the mercury in the bulb of the thermometer, and in circuit is placed an alarm bell and a battery.

The apparatus operates as follows: If, for example, the switch arm is turned to be in contact with the button marked 20°, an electric

current is established through the mercury of the thermometer when the temperature at the thermometer reaches 20°, and consequently the bell immediately gives an alarm.

This device is known as the "Phénix," and when it is installed in an establishment it positively and instantly informs the manager or the watchman of an increase of temperature in a part of the building, from any cause, such as the breaking out of a fire, overheating or an explosion, by the ringing of the bell in his office.

In factories, offices or other buildings this device is arranged to light a small incandescent lamp, which indicates which hall or room is at a dangerous temperature. Such is its use as a fire alarm, but as previously mentioned this apparatus also serves as a means of indicating temperature at a distance.

The larger number of industries have need of means to regularly indicate the temperature in various parts of their factories, storehouses, cellars, etc, They have heretofore been obliged to take the trouble to visit these sections or depend on the watchfulness of an employe to personally inspect the thermometers variously located.

M. Vila, by means of his invention enables them to know at any time the temperature of the various sections of their establishments without leaving their office. Naturally such an application calls for a special arrangement to secure precision. Should there be a change of temperature above the maximum permitted by the manager the bell informs him, and he can give orders accordingly.

In a similar way the apparatus has been constructed with a range of  $-30^{\circ}$  up to  $+200^{\circ}$ , and to give notice of a rise in temperature above a certain maximum, as well as in the case when the temperature falls below the minimum desired.

We can see that the invention is applicable to all places where temperature plays an important part of any kind, but the place above all others where it is of greatest absolute utility, is on steamships, those engaged in commerce as well as warships, for every one knows that when a fire occurs in the hold of a boat, the coal magazine or in some other part, it is generally discovered when it is too late to extinguish it.

The "Phénix" indicator makes such cases impossible, and at the same time enables the captain on the bridge to determine if the different compartments of the ship are suitably heated.

The minister of the Spanish Marine has well understood the serviceability of the invention, for by royal decree, of February 26th last, the "Phénix" device was ordered to be installed immediately on all the vessels, and in all the powder houses and store rooms of explosives which pertain to the Spanish Marine Service.

This decree was issued after a trial on the boat Carlos V, which showed in a decisive manner its evident importance, and above all the absolute security that the invention insured. Considerations were shown the inventor by the Government, in issuing to him by a decree of February 13th, the naval marine cross.

The Spanish press has showered on M. Vila, the greatest praise for his humanitarian invention, which is destined to render a very great service to a large number of industries.

The device is patented in all countries, and it is to be found in the electrical section, part V, class 27, at the Paris Exposition, in a pavilion annexed to the Spanish section.

#### PORTABLE LIGHTING PLANTS.

#### BY FRANK C. PERKINS,

The tendency of modern dynamo driving is at the present time entirely toward direct connection with the engine, even in plants of very small size. Frequently this method is adopted when belt-driven machines would do Wild West show. These are not direct-connected outfits, but the generators receive their power from a couple of 25 hp. Case automatic high speed engines delivering their power through the pulleys shown. A couple of fire engine boilers supply the necessary steam at 80 to 100 lbs. pressure. The engines operate at 550 revolutions per minute, and weigh with-

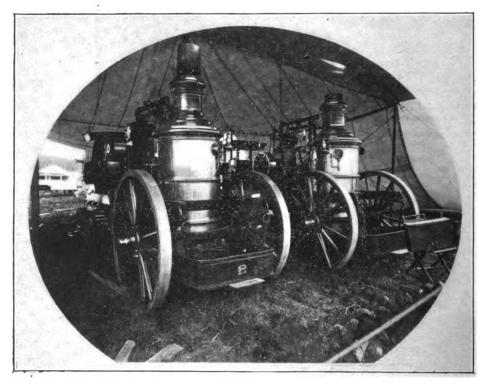


FIG. 1.—PORTABLE LIGHTING PLANTS OF BUFFALO BILL'S WILD WEST SHOW.

the work equally well, and at much less cost to the owner.

The portable lighting plant is, however, one case in which a direct driven machine has

out boiler and generator considerably less than a ton.

In Fig. 2 may be seen the latest portable outfit, which is owned by Barnum & Bailey.

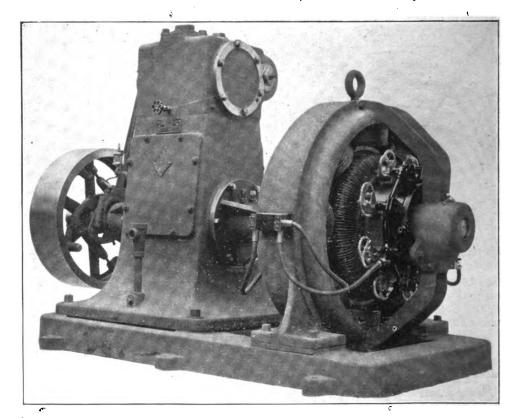


Fig. 2.—Latest Portable Outfit of Barnum & Bailey's Show.

many advantages, the principal one of which, is that of economy of space.

The illustration, Fig. 1, shows a couple of portable outfits used for lighting Buffalo Bill's

They are to use this lighting plant in their tour throughout Germany during the coming season. The electric generator is a C. & C. direct current dynamo, while the engine was built by the New Britain Machine Company of New Britain, Conn.

These engines are frequently used for portable plants with many different types of generators, both bipolar and multipolar, the engine bed plate being very often arranged with a special outboard bearing.

#### ELECTRIC HEADLIGHT LANDSCAPES.\*

The accompanying engravings will be of interest to those who have not become familiar by experience with the capacity of an electric headlight to illuminate the portion of a railway track with which the engineer is directly concerned and with which the public has an indirect concern from the point of view of safety. The illustrations are reproduced from photographs taken during the night of April 27 on the Peoria & Eastern division of the Cleveland, Cincinnati, Chicago & St. Louis Railway. The place selected was a short distance out of Indianapolis, and the time was chosen partially on account of the fact that at that time no disturbance of the light was to be expected from the untimely interposition of the moon, which was due to rise near morning. We are indebted to the courtesy of Mr. C. A. Paquette, superintendent of the Peoria & Eastern division, for



FIG. 1.—ELECTRIC HEADLIGHT LANDSCAPES.

the opportunity to pose the engine and for arrangements which insured no interruption from freight trains during the photographic process. Mr. E. M. Costin, train-master, was present as representative of the railroad company.

The engravings themselves require little explanation. Fig. 1 was taken with the engine at a point about half a mile from the bridge, which appears in the distance, while in Fig. 2 the engine was stationed about 1,000 feet from the bridge. The embankment, which appears clearly in the photograph from which Fig. 1 is reproduced, though its distinctness is somewhat diminished in the half-tone reproduction, is at a distance of about three-fourths of a mile from the source of light. The same embankment appears more clearly in Fig. 2. It should be stated also that the trees, etc., upon each side of the track, appear to a greater or less extent upon each of the negatives, but owing to the unequal distribution of light as between the

center of the track and at a distance to one side, details of this character are mostly lost in printing.

The engine used is No. 555, which is employed in passenger service on the division,

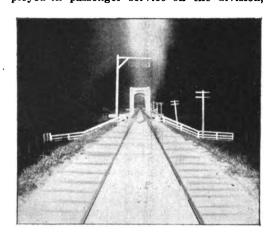


FIG. 2.—ELECTRIC HEADLIGHT LANDSCAPES, and left the scene of the photographs directly to take its place at the head of the Peoria train. The Pyle-National electric headlight constitutes a part of the regular equipment of the engine.

### SYSTEMS AND EFFICIENCY OF ELEC-TRIC TRANSMISSION IN FACTORIES AND MILLS.\*

BY WILLIAM S. ALDRICH.

The recent progress in the use of electricity for the transmission of power over short distances has developed a new industry. It bids fair to rival in magnitude and usefulness the field of long-distance transmission, much earlier developed, and now almost exclusively held by electricity. As applied to factories and mills electricity is simply a means to an end, which is primarily the transmission of power over quite short distances, from 50 to 500 feet, and within one building or a group of buildings. Upon entering this new field it has had to contest every inch of its progress in competition with long-established usage, in order to displace the unwieldly and unsightly power transmissions by shafting, belting, and rope drives. In almost all cases of new manufacturing plants, however, the features of electric transmission have received thorough consideration, resulting in many factory installations in which this system is exclusively used.

Some manufacturers have hoped that electricity would solve all of the problems, and at once, upon its introduction into their establishments; others have known it would be of no use from the beginning. There are many factories and mills in which the introduction of electricity for power transmission will not pay, under existing conditions; there are more establishments in which it would pay, in which an investment in electric transmission would prove to be a dividend-paying investment. No general rules can be laid down. Each case must be carefully examined, and a most thorough preliminary survey made of all the conditions and requirements.

SYSTEMS OF ELECTRIC DISTRIBUTION FOR FACTORIES.

In choosing a system of electric transmission for manufacturing work, it is not necessarily best to have that one system which will the

most readily lend itself to all of the work to be performed, for light, heat and power service. A composite system may prove best suited, even in such short-distance transmission. That is, lighting service will, in general, be more satisfactory, and need not be more expensive, if supplied independently of the power service. Direct and alternating currents are equally adapted for factory transmission, and by simple or multi-circuit systems of distribution; that is, by two, three, or four-wire systems, as the case may require! Preferably, all distribution should be direct; that is, without the use of storage batteries, rotary converters, or transformers, except for certain lines of work in which it may be necessary to use one or the other of these indirect systems of distribution.

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In the matter of voltages a wide range is possible: 110-volt two-wire and 220-volt threewire systems for use of either direct or alternating currents for light and power; 440-volt two-phase alternating current three or fourwire systems for both light and power: 550-volt direct-current two-wire system, or 550-volt alternating-current three-phase three-wire system, chiefly for power service, or the monocyclic system for both light and power. In general, it will not be necessary nor advisable to use over 550 volts, direct or alternating current. Shocks arising from accidental contact with wires carrying currents of this voltage are not necessarily dangerous. Experience has shown that workmen respect the distributing wires the higher the voltage. But it is not necessary to command such respect by raising it above 550 volts.

#### ELECTRIC TRANSMISSION BY DIRECT CURRENTS.

At the time that electricity was introduced into manufacturing establishments the direct-current system was the only one available. For the peculiar and exacting service required in driving all kinds of machine tools and various workshop appliances, there were difficulties to be overcome with any system. It was necessary to secure satisfactory methods of producing a large starting turning moment, or torque, for varying the speeds as might be required under uniform or variable loads, and for reducing to a minimum the trouble arising from the use of a commutator.

With direct current motors, it was a simple matter to introduce starting boxes (resistances) in the armature circuit to control the torque, as well as rheostats (resistances) in the fields to control the speed in particular. But every such resistance meant an expenditure of energy in otherwise useless heating of the wire or other material of which these resistances might be made. The so-called Ward Leonard system came to the rescue with its two additional machines in order to operate the one given machine as a motor, at practically a constant efficiency under all conditions of load and speed. This system has been very successfully and extensively used in elevators, cranes, etc. By the use of the auxiliary machines the supply voltage may be varied according to the speed desired, and the current supplied according to the torque required, without wasting any energy in heating wasteful resistances. For conditions of factory service permitting of such an application, two motors may be advantageously used on one machine or set of machines, by means of which it is possible to vary the torque and speed quite as satisfactorily as in streetcar working, by the series-parallel method of control.

The difficulties with commutators have been



<sup>•</sup> From the "Railway Age," Chicago, Ill.

<sup>\*</sup> Abstract of paper read at the Cincinnati meeting (May, 1900) of the American Society of Mechanical Engineers.

almost entirely overcome and many refinements in design effected, so that the direct-current motor of to-day leaves little to be desired. Such objectionable features as still remain are inherent in the direct-current system used, and are found to lie chiefly in the kind of armature, commutator and brush devices required. These parts are most liable to derangement, require systematic attention for cleanliness and efficiency and renewals of brushes.

ELECTRIC TRANSMISSION BY ALTERNATING CURRENTS—INDUCTION MOTORS.

The alternating current system, with its induction motor service, offered practically the only alternative to those engineers and manufacturers who did not care to be troubled with the petty annoyances and delays likely to occur at any time with the direct-current motor. The induction machine as it stands to-day is probably the most perfect motor yet developed from the standpoint of electric transmission in factories and mills. It may be started and operated from any point at any time, at practically any load and speed within its predetermined ranges. It may be used on 110, 220, 440 or 550-volt alternating current circuits of one, two or three phases. It does not require any direct-current supply as the synchronous motor does for its field excitation. It does not require any brushes, commutator or collecting rings. Offsetting these advantages, however, are certain restrictions. The speed of an induction motor falls off slightly as the load is in creased. The ability to start an induction motor from rest under a heavy load, as well as the possible speed changes during its operation, are obtained at some sacrifice of efficiency.

Induction motors, moreover, permit of higher lineal speeds than are possible with any other type, from 6,000 to 7,000 feet not being infrequent. By suitable arrangements of its field windings, this type of motor may have its speed altered in regular steps, so reducing it one-half, one-quarter, one-eight, etc. This makes possible similar changes to gear-wheel combinations, which may therefore be eliminated to the extent that the induction motor is installed to effect such changes. In almost all cases of shop driving, the slip is not objectionable, any more than the increasing slip of the driving belt as the load is thrown on. These motors will standalmost any amount of rough usage and heavy overloads, as they cannot be burned out. If excessively overloaded, the motor slows down and stops, starting up immediately as soon as the load is lightened. Ordinarily, machine tools and almost all classes of shop machinery are started at quite light loads, and the full load is thrown on when the work or the tool is up to the speed desired. For this class of work the induction motor seems specially fitted.

A larger generating power plant is required for an installation of induction motors than would be the case if direct-current motors were used. This is on account of the energy which is lost in all classes of alternating current circuits in which there is considerable self-induction, whether in the transmission wires or in the appliances used. In the case of induction motors this loss is very appreciable at light loads, becoming much reduced at average and heavy loads, at which it is almost uniform.

### SYNCHRONOUS MOTORS.

Synchronous motors are admirably adapted to factory service where absolute uniformity of speed is required, and where the extra installation of a direct current supply for their field excitation is not deemed objectionable. While induction motors are always wasteful of some energy, through their high self-induction, synchronous motors may on the other hand be brought into that condition of operation practically equivalent to the use of direct-current motors, at least for a large range of their loads. In other words, the power factor of a synchronous motor may be made almost anything from zero to unity, according to the extent of excitation of its fields by the direct current applied for this purpose.

When made in the revolving field type, synchronous motors are self-starting from rest at light loads. They may be very heavily overloaded, without falling out of synchronism or out of step, and when they do for an instant they may be brought back again by throwing off some of the load. A well-designed synchronous motor will carry at least three times its full normal load, and not drop out of step. If an induction motor is built for such overloads it is likely to have quite low efficiency at ordinary loads.

Higher efficiencies may be obtained with synchronous motors than with induction motors of the same output. In fact, such motors realize the ideal conditions of motor working in which the motor attains almost the same efficiency as the generator. Both induction and synchronous motors have usually higher efficiencies than direct current motors of same size.

COMBINED INDUCTION AND SYNCHRONOUS MO-TOR WORKING.

The ideal conditions in a factory installation no doubt would be secured where both induction and synchronous motors were used the former for small machines and direct driving, the latter for operating a set or group of machines. The synchronous motors would be started up just before beginning the work of the day, have at all times a light constant load, and might easily be so regulated as to produce an almost balanced system in combination with the induction motors. In such a system of transmission the lagging currents of the induction motors would be offset by the leading currents of the synchronous motors, if the latter were operated to produce such leading currents. The whole system would be operated practically throughout quite a range or load variations, as if it were a simple directcurrent system. The advantage of such a condition is apparent; it means least installation for any given output, or greatest output for any given capacity of generating plant. The group method of electric driving is much better adapted for small machines, up to and including 2 horse-power capacity, and especially where such machines are in almost constant service. Above this size, individual motor driving becomes more and more efficient. particularly if the machines are operated only a fraction of the day.

Last week at Leeds, Eng., an armored road train constructed for the War Office, was tested. The officers present at the trial claim the invention marks a great advance in military science. The armor is half an inch of nickel and steel, and it is proof against bullets and shell splinters at a distance of twenty yards. Each of the three trucks of the train carries one 4.7 naval gun. The trial, which was made under severe conditions, was completely successful, and the train has been shipped to South Africa.

#### THE PARIS EXPOSITION.

(Special Correspondence of ELECTRICITY.)

#### Distribution of Electrical Energy at the Exposition.

In our last letter we described the producion of energy. We will now explain the principal distribution of current for the different sections of the Exposition.

First—Continuous current is distributed during exhibition hours to the electrical machine groups.

- a. To the interior of the Palais du Champ de Mars for motive power and for lighting purposes through a conduit containing three conductors; the average tension is about 220 volts.
- b. To the interior of the Palais des Invalides for motive power only through a conduit containing two conductors, the average tension is 500 volts.

Second-Alternating current, single-phase, during lighting hours only, for the whole exterior illumination of the Palais du Champ de Mars the average tension is 2,000 volts primary and 110 volts for the secondary currents. Frequency 50.

Third—Alternating tri-phase current is distributed:

- a. During exhibition hours to the electrical machine groups under an average tension of 2,000 volts primary and 110 volts from the secondary. Frequency 50. In the Jardins du Champ de Mars, in the Jardins du Trocadero, on the Quais Debilly, and for that portion bordering on the Jardins du Trocadero.
- b. During lighting hours only on the Quais D'Orsay, from the Exposition grounds down the river, to the Alma bridge, under a tension of 2,000 volts primary and 110 volts secondary. Frequency 42.

On the Quais D'Orsay from the Alma bridge around to the bridge of the Invalides with a tension of 4,800 volts primary and 110 volts secondary. Frequency 50. In the Palace and quincunx of the Invalides to those portions lying between the longitudinal axis and the Constantine street with a tension of 2,000 volts primary and 110 secondary. Frequency 50. The section of the left bank of Paris, in the Jardins du Champ de Mars, and the Quais D'Orsay, for that portion lying between the Alma bridge and the bridge of the Invalides, a common alternating current of 3,000 volts primary and 110 volts secondary. Frequency 42.

The section of the Champs Elysée furnished are those portions of the Jardins du Trocadero contained between the Palais and the Boulevard Delessert as well as the Cours-la-Reine, which is supplied by a common alternating current, of the same tension and frequency. Current is always to be obtained from these two sources.

Electric power is furnished free for the operation of apparatus on exhibition. In all other cases the tariff is one-half franc per kilowatt hour for motive power, and 1 franc per kilowatt hour for lighting purposes. However, a rebate is allowed for lighting purposes over and above 800 hours meter measure. After this consumption is reached the consumer pays one-twentieth of a franc per hectowatt hour.

#### An Illuminated Fountain Without Water.

Besides the great illuminated cascades of the Chateau d' Eau, which are so much admired at the Exposition, we can now announce the possibility of constructing illuminated fountains without water, which is now being undertaken



at the Exposition in the Jardins du Trocadero.

The managers of this enterprise have asked Gustave Trouvé, the widely known constructing engineer, to install for them something of interest and out of the ordinary line. This project is to be a large illuminated fountain, six to seven meters high, but in solving the problem the economically disposed managers desire to evade the expense of water rates by the hour, and insist that M. Trouvé, should find something much cheaper than water. He solves the problem in the following manner: Above a large basin with a base inclined toward the center is placed a powerful electric ventilating fan, and above this is a tube conforming in size and dimensions to the desired fountain. The ordinary arc-lamp sends reflected light rays at right angles through the transparent tube. The electric lamp does not light up drops of water, but a predetermined quantity of rice grains mixed with mica and particles of tinsel. This mixture is blown through the tube by the fan, and finally falls sparkling into the basin to be again taken up by the current of air, and so on over again.

A disk containing glass of various colors is placed above the tube, and is turned by an electric motor, which impregnates the moving reflecting particles with light and causes a great variety of light effects.

The result is indeed very surprising, and natural results are well imitated; this is the way an illuminated fountain can be built without using any liquid.

# The City of Geneva at the Paris Exposition of 1900.

The City of Geneva is to exhibit at Paris, in the Salon d'houneur of the Swiss section of electricity, a plan in relief of its two electric generating stations of Coulouvreniere and Chevres. These designs will be on a scale of 1—259; they have only just been finished and are now being shipped to Paris. They are the work of M. Jacob Maurer.

# Congress of Applied Chemistry.

The Fourth Congress of Applied Chemistry will hold its next session in Paris, from July 23 to 28. It is composed of ten sections. The last section is devoted to the science of electrochemistry, and its session will be of particular interest to electricians. The organization committee of this last section is made up as follows: President, M. Henri Moissan, member of the Institute; vice-presidents, MM. Besnard, who is vice-president of class 75 of the Exposition of 1900; Bethmoul, counsellor to the Courdes Comptes; Bullier, member of the administrative council of the Metallurgical Society; Gall, administrative delegate from the Society of Electro-Chemistry; Lippmann, member of the Institute; secretaries, MM. Lebeau, professor of the Pharmaceutical High School; Minet, electrical engineer. The work outlined for this section is as follows: Batteries, dynamos, accumulators; galvanoplastic materials and general manipulations; the manufacture of ozone, chlorine of soda, chloride of potassium and of sodium; perchlorates, bioxides, persulphates; electrolytic production of metals, copper, nickel and chrome, lead, vanadium, etc.; aluminum and its alloys; the working of aluminum; the employment of aluminum as a reduced agent; magnesium, sodium and its alloys; organic compositions; electric smelting; phosphorous, graphite, manganese, tungsten, molybdenum, lithlum, etc.; manufacture of carborundum; carbide of calcium, its preparation; industrial furnaces, their management; purity of carbide, its transportation by railroads and boats; manufacture of acetylene, ways of using it; purification; models of apparatus, burners, acetylene black; rules and regulations; bleaching, purification of sewerage and treatment of sugar.

# LONDON NOTES.

[From our London Correspondent ]

## The Underground and Electric Traction.

In the course of his James Forrest lecture to the Institution of Civil Engineers, Sir Wm. H. Preece touched upon a variety of topics which may or may not have had a connection with his title, which was "The Relations Between Electricity and Engineering." Perhaps the most interesting part of the lecture, so far as practical electrical engineers are concerned, is that part which deals with the electric traction experiments on the Metropolitan Railway, for which he is one of the expert advisers. His remarks were as follows: A bold attempt is being made by the Metropolitan railways, to work the existing line in such a way as not to interfere with the present traffic or even with the permanent way. A new train of six coaches weighing 180 tons, having a motor car at each end weighing 54 tons, is about to run between Earls Court and High street, Kensington, Each motor car is mounted on bogies, and each bogie has two electric motors, so that there are eight driving wheels, each bearing 675 tons. The driving wheels have diameters of 47 inches. The length of the train is 240 feet. Each motor is rated at 200 hp., or a total of 800 hp. for each motor car. But there is a wide margin, and we have already applied 950 hp. in starting a load of 270 tons on the incline of 1 in 43. Electric traction has an immense advantage over steam traction in impressing a continuous and uniform torque or turning moment on the shaft, and consequently a continuous and uniform effort on the trend of the wheel. The action of the steam locomotive is intermittent and the bite not continuous. Hence such frequent slipping on greasy rails. Again, the maximum torque can at once be applied by the current, and, in combination with the constant effort, it increases the acceleration so that a train acquires its maximum speed much more quickly We shall increase the mean speed of the Metropolitan trains from 11 miles per hour to 15, and thereby increase the capacity of the line over 30 per cent. The stoppages on the underground railways are so frequent that the trains ars always either accelerating or stopping. They never reach their top speed as they do on main lines. Electric traction enables them to start quicker and stop more promptly. On the Metropolitan the 180-ton train acquired 20 miles an hour in 200 feet, and, when going at the same speed, it was stopped in 130 feethalf its length. Smart work on such a railway depends on the rate at which trains can be emptied and filled. The English system of compartments and side doors facilitates this. It would be still further expedited if we could have one platform for entry and one for exit, and one class only.

The Liverpool and Manchester Lightning Express Railway, promoted by a very powerful representative syndicate of those two great commercial centers to carry out the scheme of Mr. Behr, is a very bold and promising venture. The line is to be mono-rail, 34 miles long, directly between the two cities, without any intermediate station, and with no crossing. There are to be cars every 10 minutes. The speed is to be 100 miles per hour, and the time

of transit 20 minutes. I know of no reason why this should not be done with safety and comfort.

The automobile car of the future has not yet seen the light. It will be electrical. Immense p ogress has been made in motors and in batteries. Lundell has shown how to store up the energy now wasted in descending hills, and to recover some of that absorbed by the inertia of the car. Although a battery has already been able to drive a car 100 miles with one charge, we are waiting patiently for the real automotor storage cell.

## Prof. Geo. Forbes on Power Transmission.

On April 26 Prof. Forbes, F.R.S., read a paper before the Institution of Electrical Engineers in London on "Distant Electric Power Transmission." The first part of the paper was devoted to the description of certain selected transmission plants, each one put up by a different contractor and each one having some special point of interest. Although the only one with which he is practically and intimately acquainted is the plant at Niagara Falls, the plans of which were prepared by him in 1890 and carried out between that date and 1895, and the actual working of which he has thoroughly investigated up to the summer of 1899. The second part of the paper dealt with some of the problems that face the consulting engineer in his attempts to introduce the highest economy, especially in the transmission lines, as this is the most important part when the distances are great. To these two sections Prof. Forbes added some remarks giving a general view of the methods in use by different contractors.

# THE INSTITUTE MEETING.

# Carl Hering, the Newly-Elected President, Presides at the Philadelphia Meeting—The Officers.

The American Institute of Electrical Engineers held its first session in the main auditorium of the Drexel Institute, Philadelphia, on Wednesday afternoon, May 16. From 100 to 150 delegates were in attendance.

The meeting was addressed by Mayor Ashbridge, of Philadelphia, and was responded to by James McAllister.

The papers read were two in number—"A New Transmission Dynamo-meter," by Prof. W. Elwell Goldsborough, and "A Percentage Bridge," by Herschel C. Parker.

At 3 o'clock a ladies' party left Arch street wharf on a trip up the Delaware River, landing at the Morrelton Club Inn at Torresdals, where a planked shad dinner was served.

In the evening the delegates attended a smoker at the Manufacturers' Club.

# THURSDAY, MAY 17.

The meeting was called to order by Dr. Carl Hering, the newly-elected president.

Dr. A. E. Kennelly presented a report of the Committee of Units and Standards, which was discussed and accepted.

Fitzhugh Townsend, of Columbia University, read a paper on "Eddy Current Losses in Transformers." His explanation of these losses was based on experiments made in the laboratory of the University.

Samuel Sheldon, of Brooklyn, read a paper on the "Conditions of Electrolytic Corrosion in Brooklyn." A lengthy disscussion of the paper ensued.

At 1 o'clock the steamers Wm. J. Latta and the Relief took the visitors up the river to Cramps' shipyard, and returning to Arch street

wharf, picked up the late comers and continued down the river past League Island Navy Yard to Washington Park. There they partook of a planked shad dinner.

# FRIDAY, MAY 18.

The first paper presented was by F. A. C. Perrine and F. G. Baum, entitled "The Use of Aluminum Line Wire, and Some Constants for Transmission Lines." Particulars of a test of aluminum wire for a conductor were given in comparsion with copper. The tests were made on a line forty miles long. The chief advantage was in the weight, which was just half that of copper for the same conductivity. Its strength, however, was much less and its area more than a half greater, which were objectionable. One member said that it took four linemen all the time to repair the breaks.

Prof. Albert C. Crehore and Captain George O. Squier, U. S. A., read a paper on "A Practical Transmitter Using the Sine Wave for Cable Telegraphy, and Measurements with Alternating Currents Upon an Atlantic Cable." These gentlemen used an alternating current of electricity with a sine wave, cutting out one-half of the period of alternation and using either the positive or negative side. It was claimed that on experiments last year over one of the Atlantic cables a marked improvement was made, with the same receiving instruments as were in use by the cable company, by the use of the new transmitter. No figures were given to show the speed of transmission attained.

The limitations of speed on cables came up in another form in a paper read by Prof. M. I. Pupin, of Columbia University, the title being "Telephony Over Cables and Long Distance Air Lines." President Hering remarked that seven years ago it had been prophesied in a paper read before the Institute that telephones would be used over the Atlantic cables. That prophecy had not so far been fulfilled. The last paper was by Prof. R. B. Owens, entitled 'Notes on Synchronous Converters," at the conclusion of which the meeting adjourned.

Before adjournment a resolution of appreciation of the courtesies of the Drexel Institute was adopted.

# The Newly-Elected Officers.

At the annual meeting held in New York City on May 15, the following officers were elected for the ensuing year:

President-Carl Hering.

Vice-Presidents-Gano S. Dunn, Arthur V. Abbott, W. L. R. Emmet.

Managers-W. S. Barstow, Calvin W. Rice, Cary T. Hutchinson, Ralph D. Mershon.

Secretary-Ralph W. Pope.

Treasurer-George A. Hamilton.

# Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended May 19:

Antwerp, 20 cases, \$2,828, 11 packages, \$375; Argentine Republic, 33 cases, \$2,216; 180 packages, \$7,973; 18 cases electrical motors, \$2,625; Barcelona, 110 packages, \$7,751; Brazil, 124 cases, \$3,542; Bristol, 114 cases; \$11,139; Brussels, 27 packages, \$689; British Guiana, 21 packages, \$867; British East Indies, 42 packages, \$5,991; British Possessions in Africa, 45 packages, \$2,627; British West Indies, 10 cases, \$146; Central America, 83 cases, \$831; Chili, 4 cases, \$58; Cuba, 401 packages, \$20,061; Dunkirk, 2 packages, \$375; Genoa, 9 cases, \$1,538; Glasgow, 23 packages, \*921; Hamburg, 56 cases, \$6,750; Havre, 182 packages, \$19,639; 2 cases, \$634; Ipswich, 121 packages, \$12,502; Liverpool, 48 packages, \$2,778: London, 227 packages, \$9,-041; 1 case, electrical instruments, \$880; 2 boxes electros, \$134; Manchester, 2 cases, \$1,200; Margate, 112 packages, \$21,127; Marseilles, 19 packages, \$1,163; Mexico, 52 packages, \$6,138; Peru, 205 cases, \$5,242; Philippines, 19 cases, \$5,790; Rotterdam, 4 cases \$69; Southampton, 9 cases, \$233; U. S. Colombia, 9 packages, \$92.

## LEGAL NOTES.

In the Equity Court of Adams County, Pa., Judge Swope recently handed down his decision in favor of the Keystone Electric Light, Heat & Power Company, in the proceedings between that company and the Gettysburg Transit Company The two companies have been at war for three years over the ownership of the electric lighting plant operated by the Transit Company.

A summons and complaint against the First National Bank of Adams, Mass., has been filed in the County Clerk's office at Albany, N. Y., by the Municipal Telegraph Company. The company claims to have a deposit in the bank, and alleges that the bank has refused to honor certain drafts.

# INCORPORATIONS.

The Federal Electric Company, New York City, Directors: Benjamin Blum and Nathan Blum, New York City.

The Suburban Electric Railway Company, Columbus, O. Capital stock, \$150,000. Incorporators: P. Jones, G. W. Dunn, E. Denmead, A. L. Thurman and A. W. Field.

The Balzer Motor Company, New York City-to manufacture and deal in motors and engines and to acquire inventions, patents and other rights. Capital stock, \$1,000,000.

The Richmond Electric Company, Richmond, Va. Capital stock, \$100,000. The officers and directors are all Richmond capitalists, except Vice-President Joshua Hale of Newburyport, Mass.

The Consolidated Water & Light Company, Chicago, Ill. to construct water, gas, electric light, heat and power plants. Capital stock, \$100,000. Incorporators: John H. Brown, B. O. Meyer and M. T. Cook.

The Shasta Electric Light & Power Company, San Francisco, Cal. Capital stock, \$1,000,000. Incorporators: G. A. Knight, C. A. Warren, C. E. Green, F. S. Edinger, F. S. Knight, all of San Francisco.

The General Illuminating, Heat & Power Company, Norwood, O.—to manufacture electricity and gas for light, heat and power. Capital stock, \$100,000. Incorporators: C. W. Baker, V. E. Heintz, W. B. Stier, A. C. Nagle and M. G. Heintz.

The Shore Electric Light, Heat & Power, Company, Pleasantville, N. J. Capital stock, \$25,000, Incorporators: B. H. Shivers, C. H. Mann, G. B. Nye, W E. Hunt, all of Haddonfield: E. Tredick and H. L. Moulton, of Philadelphia, Pa.: P. B. Riseley, of Pleasantville; W. S. Wright, V. F. Lake, A. P. Risley, Atlantic City.

The Lockport and Newfane Power & Water Supply Com pany, Albany, N.Y.-to develop and employ hydraulic and electrical power, the generating, sale and distribution of the same, and the supplying of pure and wholesome water to cities and towns within Niagara County. Capital stock. \$500,000. Directors: Henry J. Pierce, Burt Van Horn of Buffalo, Willard T. Ransom, John A. Merritt, Harry L. Ransom, Senator Timothy F. Ellsworth of Lockport and William B. Rankine of Niagara Falls.

# COMMERCIAL PARAGRAPH.

The Chicago Fuse Wire & Mfg Company has recently moved their general office to its factory location at 58 to 64 North Jefferson street, Chicago. Owing to the largely increased business which the company has enjoyed during the past year or two it has found it necessary to increase its manufacturing facilities, and has equipped a department for the manufacture of its well known and popular line of Tested Fuse Wire and Fuse Links, in connection with the Springfield Drop Forging Company of Springfield, Mass. The company's many friends and customers in the East will appreciate this move, as it indicates progressiveness and a determination to give the trade the best possible service. The Chicago Fuse Wire & Mfg. Company informs us that all shipments for the Eastern States will hereafter be made from

the Springfield factory. It may be of interest to the trade to know that Mr. A. D. Dana, president of this company, is now treasurer and general manager of the Springfield Drop Forging Company, while Mr. W. R. Goodman, who has been well known in connection with the fuse wire line for the past twelve years, will continue to look after the interests of the business from the main office at Chicago,

# ELECTRICAL PATENT RECORD.

This department is edited by OSCAR A MICHEL Solicitor and Attorney for AMERICAN AND FORBIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N.W., Washington, D.C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Palents. Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL. Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upo ment of ten cents. When ordering give name, date and title of invention wanted,

#### LETTERS PATENT ISSUED MAY 15, 1900.

# ELECTRIC RAILWAYS AND APPLIANCES.

- 649,168. Trolley, James H. Morey and Thomas R. Watkins, Trenton, Mich. Filed Aug. 7, 1899.
  649,586. Closed-Conduit Electric Railway. Dwight G. Stoughton, Hartford, Conn. Filed April 4, 1899.
  649,597. Means to be Employed in Electric Traction. Marie J. Barreau, Paris, France. Filed July 22, 1899.

#### ELECTRIC LIGHTS AND APPLIANCES.

- 649.544 Bracket for Electric Lamps, William H. Morse, Billings, Mont. Filed March 12, 1900.
  649.549. Electric-Light System, Harry F. Roach, St. Louis, Mo. Filed June 23, 1839
  649.551. Carbon for Electric Lights, John F. Sanders, Portland, Ore, assignor to Harry Brown, Chicago, Ill. Filed Oct. 14, 1897. Renewed Sept. 15, 1899.

# ELECTRICAL MACHINERY AND APPARATUS.

- ELECTRICAL MACHINERY AND APPARATUS.
  649,525. Safety Synchronizing Device. John Pearson, Minneapolis, Minn., assignor of one half to James F. Williamson, same place. Filed July 3, 1899.
  649,554. Electric Switch. Ferdinand Schwedtmann, St. Louis, Mo. Filed April 8, 1899.
  649,699. System of Motor Control. Carl W. Larson, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed March 30, 1900.
  649,707. Electric Meter. William H. Pratt, Lynn, Mass, assignor to the General Electric Company of New York. Filed Feb. 27, 1809.
  649,767. Electric Switch. Frank L. Sessions, Oak Park, Ill. Filed Sept. 5, 1899.

- Filed Sept. 5, 1899.

# TELEPHONES AND TELEPHONE APPARATUS.

- 649,632. Automatic Telephone Toll Apparatus. Lars M. Ericsson, Stockholm, Sweden, and Sophus Ritter, Copenhagen, Denmark, assignors to the Aktieholaget L. M. Ericsson & Co., Stockholm, Sweden, Filed June 2, 1898.
  649,868. Telephone-Exchange System. William D. Gharky, Philadelphia, Pa., assignor to the Sun Electric Manufacturing Company of New Jersey. Filed April 21, 1899.

# MISCELLANEOUS.

- 649,491. Electric Storage Battery. Elmer A. Sperry, Cleveland, O. Filed Sept. 30, 1899.
  649,552. Brush-Holder for Electric Machines. Harry Sawyer, Muskegon, Mich. Filed Dec. 6, 1899.
  649,555. Process of Manufacturing Caustic Alkali and Halogen Gas. Charles E. Acker, East Orange, N. J., assignor to the Acker Process Company, Niagara Falls, N. Y. Filed April 8, 1899. gen Gas. Charles E. Acker, East Orange, N. J., 2005, to the Acker Process Company, Niagara Falls, N. Y. Filed April 8, 1890, 572, Controlling and Distributing Electric Energy, Frederick W. Erickson, Beston, Mass. Filed Feb. 24,

- 1990.
  S87. Electric Clock. Samuel P. Thrasher, New Haven, Conn. Filed March 5, 1897.
  S88 649.590. Time-In ficating Device. Samuel P. Thrasher, New Haven, Conn. Filed March 8,1897, March 16, 1897.
  S89-649-591. Secondary Electric Clock. Samuel P. Thrasher, New Haven, Conn. Filed March 15, 1897, July
- 1, 1898.
  649,614. Apparatus for Electrolysis. Antoine E. Peyrusson, Limoges, France. Filed May 15, 1896.
  649,620. Electric Brake. Christopher W. Steele and William A. Nesbitt. Toronto, Can. Filed Feb. 27, 1899.
  649,621. Apparatus for Transmission of Electrical Energy. Nikola Tesla, New York City. Original application filed Sept. 2, 1897. Divided and this application filed Feb. 19, 1900.
- 1900.
  649,644. Controller Mechanism. Almon E. Norris, Cambridge, Mass. Filed Sept. 16, 1899.
  649,653-649,654. Battery Compound. Henry Blumenberg, Jr., New York City. Filed April 24, 1899. Sept. 27, 1899.
  649,661. Electric Signaling Apparatus Francis K. Fassett. St. Louis, Mo., assignor to Leo Ehrlich, same place. Filed July 10, 1899.
- 5t Louis, no., assigno. 55 222. July 10, 1899. 726. Process of Protecting Electric-Heating Conductors, William S, Hadaway, Jr., New York City. Filed Jan. 26,
- 1898.
  78 Electrical Igniter for Gas Engines. Daniel M. Tut-tle, Canastota, N. Y. Filed Feb. 20, 1899.
  88. Induction Coil. Halle E. Willis, Lebanon, N. H., assignor to Kendrick & Davis, same place. Filed Feb. 14,
- 1980. Process of Operating Primary Batteries and Regenerating Elements Thereof. Henry K. Hess, Albert J. Shinn and Carl Hering, Philadelphia, Pa., assignors to Herman J. Dercum, trustee, same place. Filed Dec. 6, 1819.
- 1809.
  1819.
  1819.
  1819.
  1811. Process of Operating Two-Liquid Primary Batteries and Regenerating Elements Thereof. Henry K. Hess, Albert J. Shinn and Carl Hering, Philadelphia, Pa., assignors to Herman J. Dercum, trustee, same place. Filed Dec. 6, 1889.
- Dec. 0, 1888. 833. Printing-Telegraph. Joseph Stockert, Kothen, Germany. Filed Dec. 5, 1889.

# GENERAL NEWS.

# What is Going On in the Electrical World.

#### LIGHTING.

Antigo, Wis.—W. L. Elliot, proprietor of the electric light plant, contemplates the purchase of a new engine, and two 2,000 candle power dynamos.

Avoidale, Pa.—There is talk of establishing a new electric light plant at this place.

Buffalo, N. Y.—Julian E. Woodwell, the electrical engineer of the Treasury Department at Washington was here a short time ago working in conjunction with Superintendent of Construction Otto G Simonson on calculations and preliminary plans for the installation of a plant in the new post office building to generate power for lighting the building with electricity, and for such other purposes as may be found necessary.

Cape Vincent, N. Y.—The citizens of this place are in favor of establishing an electric light plant here.

Colina, O.—The council recently passed a resolution submitting the question of issuing bonds in the sum of \$25,000 for the purpose of putting in an electric light

The electric light plant here was Converse, Ind. partially destroyed during a recent storm

Dolton's Station, Itl.-This village is preparing to erect a new electric light plant.

Ephriam, Utah.—The city council has appointed a special committee, consisting of Councilor Larsen, John D. rins, Jr., C. A. Larsen. Peter Thompson and David P. Madsen to make investigation as to the city putting in and operating an electric light plant.

Grant Park, Ill.—The electric light question is being discussed here.

Halstead, Kan.—There is some talk of putting in an e'e ctric light plant here.

Hartford, Mich.—Auderson Brothers have decided to ins all an electric light plant at this place, and work will begin at once.

Helens, Mont.—The citizens here have voted to sue bonds for the purpose of erecting an electric light plant.

Hillsboro, Tex -The council is considering the ques-

tion of erecting an electric light plant at the place.

Kingston, N. Y.—The West Shore Station at this place is to be lighted with electricity.

Lakeview, Ore.—Bids are asked until Ju'y 19 for the purchase of \$10,000 in bonds for erecting an electric light plant. Address Chas. Umbach.

La Porte, Tex —I. Beck is interested in a company which will erect an electric light plant in this city.

Laurel, Dal.—This place will soon have the modern advantage of a complete electric lighting system.

Liveland, Col.—The city council has issued bonds for the purpose of erecting a municipal electric light plant. Address C. C. Bushnell.

North Brookfield, Mass—E. A Bachellor, L. S. Woodis, D. A. Clark and P. J. Daniel have been appointed a committee to secure plans etc., for a municipal electric light plant to cost \$10,000.

Ocion, Ill.—R J Fullerton, a former Rock Islander, who is now a resident of this place, has been delegated by the town board to investigate the cost of installing an electric light system.

Park River, S. D —This town is considering the question of erecting an electric light plant. J. Wyllie, mayor.

Port Gibson, Miss.—This city will put an additional dynamo in its electric lighting plant to increase the

Sabring, O—H. H. Whitacer has prepared plans and specifications for a new electric light plant to be erected at this place in the near future.

Tonawands, N. Y.—The board of trustees of this village has voted to abolish gas and substitute electricity for public lighting.

Virginia. Ill.-The matter of erecting a village electric lighting plant is being discussed here.

Wappinger's Falls, N. Y.—This town has engaged W. M Sheehan of New York to prepare plans for a municipal electric light plant.

Woodbury, Pa.—The introduction of gas and electricity is among the contemplated improvements for this place.

Woodsville, N. H.—H. S. Coolidge contemplates the erection of an electric light plant at this place.

# STREET RAILWAYS.

Alleghan, Mich.-David Cornwell of Monterey and Milcon D Owen of this place have been granted a franchise by the township board for an electric street railway along the Monterey road north.

Atchinson, Kan.—A project is being considered here in regard to the construction of an electric railway connecting the towns of Doniphan, Troy, Highland, Severance. Wathena, White Cloud, and other Doniphan County towns with this city.

Chicago, Ill.—By permission of the municipal authorities here, the Chicago, Milwaukee and St. Paul Railroad is to establish and operate three new trolley

lines within the limits of this city, tapping the north shore of Lake Michigan as far as Llewellyn Park on the northwest side. These additional suburban lines will have a total mileage of 30.07 and will cost about \$450,000. This will give the St. Paul road control of the suburban business of the entire northwest territory in thickers. in Chicago.

Cleveland. O .- The Little Consolidated Company of this city has arranged to change the cable to electricity for the entire Superior street line.

Columbus, O.-The Columbus Suburban Electric Bailway Company was recently incorporated for \$150,000 by P Jones, G. W. Dur, E. Donmead and J. Ross. The company will construct and operate an electric railroad between this city and Dublin.

East Liverpool, O—The right of way for an electric railway to be built between this city and Vanport. Pa., a distance of 14 miles, has been secured, and work on the new road will begin soon.

El Paso, Tex.—The street railways in this city have consolidated. The one company is to be known as the El Paso and Juarez Traction company, which is capitalized at \$200,000. The purpose of the new concern is to establish electricity as the motive power and abandon the old mule car system.

Evansville, Ind.—The survey of the route for the electric line between here and Boonville has been com-pleted and work will begin at once.

Jersey City, N. J.—The North Jersey Street Railway, which owns most of the street railways in the northern which owns most of the street railways in the northern part of this State, is planning to put through its projected trolley line from this city to Philadelphia as rapidly as possible It is asserted on good authority that all of the lines of the syndicate will be joined and that an entrance will be gained to New York City from the north. The new line will join the Huckleberry road, which is a part of the Third Avenue system.

Keene, N. H.—It was recently decided to build electric railroads here, and out as far as Marlboro Village. The storage house for the cars is to be at South Keene. G. G. Davis of Marlboro is interested.

Lebanon, Ill.—The movement by the Commercial Club of this city for building an electric railway between East St. Louis and this place via O'Fallon is progressing favorably. S. Smiley of O'Fallon has obtained a large part of the right of way.

Lexington, Ky.-The State College students have completed a survey for an electric railway to connect Nicholasville with this place. The estimated cost of the construction will be nearly \$100,000. The distance is 12 miles.

Los Augeles, Cal.—The Terminal Railroad Company will ask for a franchise to have its electric line from Pasadena enter this city.

Newark, N. Y.—The Newark & Marion Railway Company was lately incorporated with \$100,000 capital stock to construct a street surface electric road 8 miles long in this place. The directors are E. V. Pierson, long in this place. The directors are E. V. Pierson, F. D. Burges, of Newark; C. L. B. Tylee, of Penn Yan, and C. H. Scott, of Marion.

Penn Yan, N. Y.—The long talked of electric rail-road betwean this village along the east side of Keuka Lake to Hammondsport, a distance of nearly 25 miles, seems now to be assured, and will probably be in operation this fall.

Rahway, N. J. -Many citizens of this place are now anxious to have Rahway and Elizabeth connected direct by trolley, and it is understood that an affort will soon be made in that direction.

Springfield, Mass.—Capitalists of this city and Hart-ford will attempt to connect the two cities by a trolley line this summer.

# MANUFACTURING.

Pittsfield, Mass.-The Stanley Electric Manufacturing Company will expend about \$370,000 in the construction of its new plant in this city. The company has recently received a large number of small orders, has recently received a large number of small orders, and with the present capacity of the works it is impossible to keep up with them. Two large generators of 3:0 kilowatts each, and a special switchboard were lately shipped to Et Paso, Tex., and will be used in that city for municipal lighting.

Stranton, Pa.—A short time ago the Metropolitan Electric Company awarded the contract for a 1000 horse power vertical Cross compound engine to the Dickson Engine Company of this city. The new engine will be installed in the plant on South 7th street about the 1st of October.

about the 1st of October.

Syracuse, N. Y.—Henry Eager recently returned from New York, where he had been in the interest of A. C. Powell & Son, manufacturers of dynamos and motors. He closed several contracts which, with other business contracted for at home, will keep the firm busy for several months. The facilities for lurning out electrical apparatus have been enlarged.—The Prismatic Electric Sign Company of Williamsport, Pa., has moved its factory to this city where it will concontinue the manufacture of signs. The invention is that of C. H. Hill, who was formerly superintendent of an electric light concern and now resides in Syracuse.—R. M. Cornwell and F. M. Smalley of this city are the directors of the R. M. Cornwell Company, recently formed here to manufacture electrical supplies, with a capital of \$20,000. with a capital of \$20,000.

Waterville, Me.-C. W. Davis, of this place, D. A.

Proctor, T. H. Bibber, D. W. Dunn, all of Boston, Mass., and E. L. Brown, of Waltham, are the incor-Mass., and E. L. Brown, of Waltham, are the incor-porators of a company formed here lately, known as the Federal Wire Company for the purpose of manu-facturing and dealing in wires for electrical work.

#### COMPANY MATTERS.

Chicago, Ill.—The American Electric Wire Company of this city has increased its capital stock from \$5,000 to \$15,000.—The contract for the new electric light plant and waterworks system at Two Rivers, Wis., has been let to C. A. Inglehart & Co. of this city for

Colchester, Ill.—The electric light company of this place is about to install new machinery that will furnish nearly double the power of the plant now in use

Corpus Christi, Tex.—The Corpus Christi Electric Light Company will improve its plant. E. A. Born, manager.

Grand Bapids, Mich.—The power house of the Grand Bapids Electric Light & Power Company was recently destroyed by fire. Loss \$20,000.

Indianapolis, Ind.—The Indianapolis Light & Power Indianapolis, Ind.—The Indianapolis Light & Power Company will put in a storage battery in the Lyracasino Building on Meridian street. Its complete cost will be \$9,000. The battery will have 156 cells, 24 feet wide and 5 feet deep, each of which will contain 51 plates, and weigh 5,000 pounds. With this battery a uniform voltage will be maintained on the entire system. Should a break-down occur at the power house the battery is of sufficient power to furnish light for the city. the city.

New Haven, Coun.-The Meriden-Southington Company and the Connecticut Lighting & Power Company have finally arrived at an agreement, whereby the latter company will be permitted to use the poles of the former in bringing in the feed cables from New Britain to be used for furnishing the town with electric lights.

Philadelphia, Pa.—By a recent transaction the Consolidated Electric Company of this city obtained control of the electric light plants in O.l City and Frank-

Pipestone, Minn.—The Pipestone Electric Company has been reorganized under the name of the Pipestone Electric and Construction company. The management of the entire plant will be in the hands of J. McNerny, of Minneapolis.

Reading, Pa.—The Arrowsmith Electric Company, Limited, has leased the property, 446 Penn street, and will move about June 1.

# POWER AND TRANSMISSION PLANTS.

Bellefonte, Pa.—A number of capitalists of this place are considering a project for the harnessing of Spring Creek at a point in the gap of Muncy Mountain in order to secure power for the operation of a large electrical plant at Milesburg. The purpose is to furnish the current sufficient to operate a trolley line through the streets of Bellefonte and between this place and Milesburg, with the probability of extension west to Philipsburg and south across the Saven Mountains to Lewistown. tains to Lewistown.

Buffale, N. Y.—The board of directors of the Expo Buffale, N. Y.—The board of directors of the Exposition Company has authorized D. rector General Buchanan to conclude with the Niagara Falls Power Company and the Cataract Power & Conduit Company contracts under the best terms and conditions possible for 5,000 horse power, at a sum not exceeding the amount named by the companies in proposals which they submitted to the Exposition Company some time ago. The power will be transmitted from the terminal station of the Cataract Power & Conduit Company at Ontario and Niagara streets to the Exposition grounds, where a transformer house will be built.

Canon City. Col.—The Electric Power Company

Canon City, Col.—The Electric Power Company whose large plant in this city supplies power and light for many of the mines in the Cripple Creek district, is preparing to double its capacity.

San Francisco, Cal.—The Yuba Electric Power Com-San rencisco, Cal.—The Yuba Electric Power Company, represented by Engene de Sabla, Jr., of this city, has made application to the board of supervisors for franchises to run lines into Yolo, Solano, Contra Costa and Alameda Counties for transmission of electricity for power and lighting. The company is incorporated for \$1,000,000, and is headed by R.R. Colgate of Naw York.

Trenton Falls, N. Y .- The Utica Electric Light & Power Company is pushing the work of harnesing the power of West Canada Creek at this place, and expects to get its lines to Utica by next fall. Several thousand horse power will be carried to Utica by wire.

# AUTOMOBILES.

Elizabeth, N. J.-A project is now on foot toward the establishment of an automobile coach line to run be-tween this place and Morristown, a distance of 18 miles. It is stated that the auto-coach can easily make the trip in an hour and a half.

Minneapolis, Minn.—The automobile is making its way in this city. Five of the ten that were ordered this spring arrived lately and are now in use. The others are expected soon.

St. Louis, Mo.—This city has recently started to run an automobile for public transportation. It is operated by electricity.



# THE TELEPHONE WORLD.

#### Opposition to the Bell in Buffalo.

The Bell Telephone Company is to have opposition in Buffalo, N. Y.

This statement has been made time and again for several years past, but each time the opposition has failed to materialize. This time, however, there seems to be not the slightest doubt that opposition is to become a certainty.

The opposition is the Buffalo Telephone Company, capitalized at \$500,000, and having such men as George K. Birge, Daniel N. Lockwood, Charles E. Williams, Leonard B. Crocker, W. H. Kinch, William B. Hoyt, Augustus F. Scheu, Frank L. Bapst, and Reuben J. Getz on its board of directors.

Two years ago this same company put in an application to the common council for permission to lay conduits, string wires, erect poles, etc. The application was sent to the committee on streets where it has since laid dormant.

The reasons for not pressing the application at that time were probably that there was no possible hope of getting a favorable report from the common council,

About a month ago the idea of renewing the application dawned upon the backers of the new company when certain Eastern capitalists came to Buffalo and looked over the ground with a view to installing a competitive telephone company. These capitalists are the same ones who have successfully started "home" companies in Trenton, N. J., Syracuse and other cities.

Then it was that the local company was aroused. Subscription blanks were gotten out, and a large force of solicitors put at work. To day the company claims to have the signatures of 1,000 prospective subscribers.

The Southern New England Telephone Company is about to inaugurate a rather unique feature in its system in the shape of a sanitary mouthpiece for use on the transmitters in all public stations. These little mouthpieces are described as "positive preventive of dirt, disease and disagreeable odors." It is the purpose of the officials of the company to so distribute these mouthpieces at public stations that each user of such a public telephone may talk into a new and clean one. In other words, a mouthpiece will be used once and thrown away. The mouthpieces were invented and patented in the offices of the company. They are made of a special white paper, and are odorless. Private subscribers can purchase the mouthpieces, while of paper, transmit sound distinctly.

The Georgia Telephone and Telegraph Company has opened its exchange in Savannah, Ga. It already has some 500 subscribers and new names are being added to the list. There is a capacity on the switchboard for 1,200 subscribers, and orders have been placed for two more sections, each to have a capacity for 300 lines. This apparatus will readily respond to orders for connections promptly, and the officers of the company think it by no means unlikely, so confidently do they rely upon the efficiency of the service they will give, that it will not be long before there will be 1,800 subscribers' lines in use. Nearly all the connections now made are in the business section.

A despatch from Topeka, Kan., states that the State board of telegraph and telephone assessors have divided telephone exchanges into three classes for assessment and fixed a valuation rate that will raise taxes from 25 to 50 per cent. The Missouri and Kansas Company will be taxed \$1.25 for each pole, \$5 a mile for wire and \$5 for each instrument. The new toll lines in Southern Kansas, in the second class, will pay \$24 a mile for the first wire and poles, \$6 for each additional wire a mile and \$5 for instruments. The third class of exchanges will comprise what is known as the "barbed wire" exchanges through the country. They will pay 75 cents a pole, \$2 for iron wire and \$3 for instruments.

Vice-President H. S. Hyde of the New England Telephone & Telegraph Company, said that of the \$5.000,000 of new stock authorized from \$1.000,000 to \$2.000.000 will be issued this year, and the rest from time to time. The total increase probably will suffice for five years.

The United States Long Distance Telephone Company is now getting the right of way and building a copper wire cross-arm line from Columbus via Galloway, Georgesville, Lilly Chapel and London to Springfield, O.

A bill has been introduced in the Senate at Washington authorizing the commissioners to permit the erection of poles and the construction of telephone lines east of the Anacostia River in the District of Columbia.

Flemingsburg, Ky., capitalists have succeeded in organizing a telephone exchange for that place.

#### Meeting of Independent Companies.

Between seventy-five and one hundred managers of independent telephone companies of Ohio met in Cleveland recently. The object of the meeting was to discuss and become familiar with the best methods to be pursued in hurrying long distance calls. All of the independent telephone companies have entered into a contract with the United States Telephone Company, a corporation devoted entirely to long distance service, to act in conjunction with the latter. Most of the independent companies have different systems, and the meeting was for the purpose of becoming acquainted with these various systems, having in view a better long distance service, which will not be sacrificed to local business.

James M. Thomas, who is a leading official of the United States Telephone Company, scoffed at the report to the effect that the Bell system is absorbing the independent companies. "The first thing you will hear," said Mr Thomas, "will be when the other people absorb the Bell people."

# Bell Company Boycotted.

A boycott has been declared in Buffalo. N. Y., upon the Bell Telephone Company by the United Trades and Labor Council on account of the existing strike among the linemen. Orders were recently issued by John T. Butler, business agent, forbidding any union laborer who is affiliated with United Trades and Labor Council from talking over the 'phone. All union labor men have been notified of this boycott, and for every violation the person using the telephone will be fined \$50.

Railroad Commissioner Osborn, who is charged with enforcing the law relative to the stringing of wires across rati-road tracks in Michigan, is about to renew the inspection which was discontinued during the winter months, and entirely new specifications for the guidance of telephone, telegraph and other companies using electric wires have been prepared. The specifications provide for poles having a diameter of seven inches at the top and require that such poles shall be set in the ground from six to eight feet, according to the height of the pole, the object being to set the poles to such a depth that there will be no possibility of their being blown over by the wind. Poles shall not be set farther apart than one hundred feet at railroad crossings and must be provided with double cross-arms. All poles at crossings shall be safely guyed, and all wires crossing radroad tracks must be at least twenty-two feet from the ground. The increase in the number of wires crossing railroad tracks has greatly augmented the hazard to railroad employes and the commissioner desires to have them put up as securely as possible. Inspectors will visit the principal cities and towns of the State and see that the wires conform to the specifications of the railroad department.

The Capital Telephone Company has been incorporated at Jefferson City, Mo., with a capital stock of \$50,000. The company was organized by residents of Jefferson City, who propose to put in an exchange in competition to the Bell system operated by the Missouri & Kansas Telephone Company of Kansas City, and will furnish telephones at lower rates than the present system charges. The company will also build toll lines through the adjoining counties. The incorporators are Ed. T. Orcar, Sam B. Jeffries, A. M. Hough, Dr. J. P. Porth, Ed. R. Hogg, G. A. Fischer and Houck McHenry. The officers are Dr. J. P. Porth, president; Judge A. M. Hough, secretary, and Ed. R. Hogg, treasurer.

The board of aldermen of Worcester, Mass., have been petitioned by the Massachusetts Telephone and Telegraph Company, constituting the Massachusetts branch of the Telephone, Telegraph and Cable Company of America, for a right of way through certain streets of that city, which will form the connecting link in the new proposed long-distance line from Boston to Albany, Burfalo, Cleveland, Chicago and the northwest, and to New York City by the way of Springfield. With exception of that portion of the route which passes through Worcester, the company has the right of way for its pole line from Boston to the New York State line.

The State Department at Washington has received from Consul-General Guenther, of Frankfort, and Consul Hughes, of Coburg, reports to the effect that the annual charge for telephones in Wurtemberg has been reduced to \$19.04. The cost for a five minutes' talk over the local circuit is 1.19 cents; for a distance not exceeding 19% miles, 2.38 cents; up to 31½ miles, 4.76 cents; for longer distances, 11.9 cents.

"That telephone franchise should be extended and the promoters of the independent company allowed to go on and establish its system," is the verdict of the public at Binghamton, N. Y.

The Citizens' Telephone Company of St. Joseph, Mo., has increased its capital stock from \$100,000 to \$150,000.

## The Rochester Telephone Exchange.

The Rochester Telephone Company of Rochester, N. Y., has just opened its exchange. Perhaps the most attractive feature of the spacious exchange building is the switchboard. This is 861/2 feet in length, giving facilities for 3,600 subscribers, each of the thirty-six operators having one hundred subscribers in her section. The board is of the multiple type; that is, connections from the line of every subscriber in the system are brought within the reach of each operator, who can thus place any two subscribers in communication without delay. There is no jingling of bells at this switchboard. When a subscriber removes his receiver from the hook, a little opal lamp called a pilot-lamp, is lighted and the subscriber's number is thrown up, much as in the case of a cash register. A plug is inserted in the subscriber's number, and also in the number required, and communication between the two is established. When both subscribers have "hung up" a little red light appears. This is called the clearing out signal, and indicates that the subscribers are "through." Both plugs are then removed, and normal conditions are at once restored. At a separate desk sits a supervising operator, and at this desk both pilot-lights and clearing signal lights from every section of the board are duplicated, and the supervising operator also is in direct connection with every section of the board. In this way it is practicable to prompt service on the part of the operators at all times. The switchboard was constructed by the Stromberg-Carlson Telephone Manufacturing Company of Chicago at a cost of \$100,000.

## Capitalized for \$15,000,000.

The Pacific States Telephone & Telegraph Company has been incorporated at Portland, Ore.. with a capital stock of \$15,000,000. A portion of this stock will, it is said, be used for the purpose of acquiring all of the property rights of the different telephone companies of the Pacific States, including the Pacific Telephone & Telegraph Company of San Francisco; the Sunset Telephone & Telegraph Company of California and Western Washington, the Oregon Telephone & Telegraph Company, and Inland Telephone & Telegraph Company of Oregon and Washington, and a portion of Idaho.

A large portion of the new capital will be used for the immediate and extensive enlargement of all the several plants, the demand for telephones on the Pacific Coast, especially within the last two years, having far outrun the present facilities of the several companies, the net gain of subscribers to the different exchange systems on the Coast being at the rate of nearly 100 for every business day, the total number of such subscribers at this date being in round numbers 75,000, the large exchanges being San Francisco, with 19,000; Los Angeles, with 7,000; Portland, with 6,000; Seattle, with 4,500.

The principal office of the new company will be in Port

In New York telephone circles it is believed that the Telephone, Telegraph & Cable Company of America is interested in the negotiations for the acquisition of the franchise of the Illinois Telephone & Telegraph Company, which, according to rumor, is to be sold to an Eastern syndicate.

The prospects are said to be good for the early completion of the long distance telephone line into Tuscumbia, Ala., connecting Sheffield and Florence, which last summer was built as far as Cherokee, when work on the same was stopped.

Work has been begun on a telephone line from Lois to Scivally, Tenn. This line will give Scivally telephone connection with Lynchburg via Lois.

The Southwestern Telegraph & Telephone Company is placing its wires underground in Dallas, Texas.

# TELEPHONE INCORPORATIONS.

The Williamstown and Owenton Telephone Company, Williamstown, Ky. Capital stock, \$25,000.

The Magoupin Telephone & Telegraph Company, Carlinville, Ill. Capital stock, \$10,000. Incorporators: James A. Fletcher, C. G. Heinze and Robert Whitely, Jr.

The International Interior Telephone Company of West Virginia, Baltimore, Md. Capital stock \$50,000. Incorporators: T. F. Wilcox, C. H. Hook, G. F. Jones, C. C. Hughes, D. S. Pindel, all of Baltimore, Md.

The Plainfield Telephone Company—to construct and operate an independent telephone system in Union, Somerset and Middlesex counties, N. J. Capital stock, \$15,000. Incorporators: Andrew Dingler and Robert J. Emery, Jersey City, and Henry J. Atkinson, of Red Bank.



# ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers at compiled from special reports received by Electricity from a variety of sources The subjoined quotations of Electrical Securities dust in at the leading commissions for the subjoined quotations of Electrical Securities dust in at the leading commissions. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crk. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; extension; gcn., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

# STOCKS.

PASSE	N	GER F	AILW	AYS.		PASSENGER RAILWAYS.							
		Capital	Stock.	Bate and Date of		1		Capital Stock.			Bate and Date of		
VANE.	Par	Authorz'd	Issued.	Last Div.	Bid.	Asked.	NAME.	Par	Authorz'd/	Issued.	Last Div.	Bid.	Aske <b>4</b>
Albany, N Y May 21. United Traction		<b>9</b> 5, <b>000,00</b> 0	<b>\$5 000 000</b>	1 <b>½ % Q.</b> ,	124	125	Hartford Conn.—May 21: Hartford Street Ry. Co Hartford & Weet Hartford RR	100 100	\$4,000,000 1,000,000	\$200,000 247.000	3 % 8., Oct.,	15 <b>0</b>	=
(Consolidation of the Albany and Troy City Bailway.)							Holyoke Mass.—May 21. Holyoke Street By, Co	100	400,000	400.000	3 % A., June,	2073	212
Allentown PaMay 21:			1				Hoboken, N. JMay 21			200,000	7, 11, 0110,		
Allentown & Lehigh Val. Trac. Co		4,000,000	1,500,000		••	15	North Hudson Co. (N. J.) Ry. Co	26	1,250,000	1,000,000	8 <b>%</b> ,	150	-
Bridgeport, Conn—May 21: Bri lgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	103		Indianapolis, Ind-May 21 . "Indianapolis Street Ry		5,000,000	5,000,000		24	24 %
Baltimore MdMay 21 a United Rail ways & Elec. Cocom	. 50	24,000,000	18,000,000	••••••	181/4	181/4	Lancaster, Pa.—May 21 Pennsylvania Traction Co		10,000,000				_
Boston, Mass.—May 21			. 001 005	1 9 0 70-15	Į.		Lancaster & Col. Electric By West End Street Bailway		• • • • • • • •	87,500	***************************************		=
Naw England Street By	100 100 50	2,000,000 10,000,000	4,000,000 2,000,000 9,085,000 6,400,000	1 % Q., Jan.15, 6 % S., A. & O. 3 % % S., Oct., '19 4 % S., Jan. 2 % % Aug. 59,	15 85 93 112 144 ½	16 87 94 114 145	Louisville, Ky.— May 21 : Louisville Ry.————————————————————————————————————		2,500,000	2,500,000	1½ %., April. 2½ % 8., Oct. 1,	78 110	79 111
Brooklyn N. Y May 21: Brooklyn Oily By	100	2,000,000	1,928,400	•••••	231	236 71	Twin City Rapid Transitcom. Twin City Bapid Transit? % pid. Montpeal Connect - New 21		17,000,000 8,000,000	15,010.000 1,712,200	15% % Oct.	(88% 186	68 1/6 187
Brooklyn Rap. Transit Co., tr cerf. eBrooklyn Heights Railroad *dBrooklyn City RRguai eBrooklyn, Queens Co. & Sub. RB	100	200,000 12,000,000 2,000,000	200,000 12,000,000 2,000,000	8½ % Q., Jan.,	107 257	109 289	Montreal, Canada.—May 21 Montreal Street Ry. Co Toronto Street Ry. Co	50 100		4,000,000 6,000,000	8 % 8., M. & N. 1% % 8., J. & J.	24°34 9634	219 96%
Kings County Elevated		2,000,000 4,750,000	1,884.200 4,750,000	2 % % Nov., 99	325	330	Memphis Tenn.—May 21: Memphis Street Railway Co	100	500,000	500,000	**********************	25	_
Kings County Traction Co	50	6,000,000 2,000,000	6,000,000 2,000,000		75	80	New Haven, Conn May 21: Fair Haven & Westville RR	25		2,000,000	8 % S., Pept.	89	41
gBrooklyn, B. & W. E. Railroad Buffalo N. Y.—May 21: Buffalo & Niagara Falls Elec. Ry	100	1,250,000	1,250,000		74	75	New Haven Street Railway Co New Haven & Centerville Winchester Avenue RR	100 100 25	700,000	800,000	2½ % Å., July	15	46
*Buffalo Railway Co		6,000,000	5,870,500	1 % Q. Dec., 99	99	100	New OPleans, La.—May 21 Canal & Claiborne RR. Co	40	240.000	240.000	1 % 8., July,	1	ľ
Columbus O.—May 31: Oliumbus Street Railroad Columbus Street Railroad, pfd	100			l % Q., Feb.	26 t5	28 88	New Orleans & Carrollton RR New Orleans Traction Co new com. New Orleans Traction Co new pfd.	100 100 100	1,200,000	1,200,000	1 % % Q., Oci.	148% 22% 95	94 96
Charleston, S. C.—May 21 Oharleston City Ry. Co		100,000		8 % 8,	-:	::	aCrescent City RR	100 100 50	2,000,000 500,000	2,000,000 185,000	3 % S., Jan., 4 % S., Jan., 1 % %., June, 1 % %. Oct.,	2014	52
Calcago, III.—May 21							New York-May 21:	1					
Chicago City Ry. Co. Cnicago & South Side R. T. RR. Lake Street Elevated RR. Metropolitan West Side Elev. Ry. Met West Side El., pfd. North Chicago Street RR. ANorth Chicago City RR. South Chicago City Rallway. West Chicago St. RR. Co. Union Traction Ry. Union Traction Co. pref	. 100 . 100 . 100 . 100 . 100 . 100	0 10,823,800 0 10,000,000 0 15,000,000 0 15,000,000 0 10,000,000 0 2,000,000 0 20,000,000	10,828,800 10,000,000 7,600,000 9,000,000 249,900 1,608,200 18,189,000 624,900	Feb 28 1900.  8 % Q., Jan.  1 % % Q., Feb.  35 %	264 85 27 105 221 110 24 767	23 1014 227 26	Central Crosstown RE  oChristopher & 10th Sts. RRguar Dry Dock, E. Brdw'y & Battery RR. dMetropolitan Street Ry. Co.  «Bleecker St. & Fulton Fy. Ry. guar /Broadway & Seventh Aveguar /Broadway & Seventh Aveguar /AEighth Avenue RR  42d St. & Grand St. Ferry RR. guar /Ninth Avenue RR guar /ESixth Avenue RR guar	. 100 . 100 . 100 . 100 . 100 . 100 . 100	850,000 1,200,000 45,000,000 900,000 1,800,000 1,000,000 750,000 800,000	1,200,000 45,000,000 900,000 2,100,000 1,800,000 748,000 800,000	2½ % Q., Oct., 1½ % Q., Nov., 2½ % Q., Feb ,1900 3½ % A., July, 2½ % Q., 2½ % Q.	895 895 198 205	809 185 124 <sup>1</sup> / <sub>2</sub> 155 86 240 201 400 410 205 210
Cincinnati, OhioMay 21:							Second Avenue RRguar	. 100	600,000 2,500,000	1,862,000	4% % Q. 2% Q., Jan,	199	475 201
Oincinnati Inc. Plane Rycom Cincinnati Inc. Plane Rypfd Cincinnati, Newport & Cov. St. Ry (Cincinnati Street Ry. Co	100	0 4,000,000 0 4,000,000	)) 100,000	¼¾ Feb. 2¼¼ Feb. 1½¼ % Q., Jan.	83	89	Third Avenue RR	100	2,500,000	2,500,000	• p. sn. reb.	109 190	200 200 300
Mt. Adams & Eden Park Inc. Ry Cleveland, Ohio.—May 21:	54 54	18,000,000 2,500,000	2,200,000	1% % Q., Jan.	1245	••	Consolidated Traction Co. of N. J North Jersey Street Railway Co. United Electric Co. of New Jersey	100		6,000,000		53 27 28%	60 271 241
Agron, Bed. & Clev. Elec. By  Cleveland City Ry  Cleveland Electric By		8,000,000	7,600,000	14 % Jan. 3-5 % Jan. 14 % Q., Oct., '99.	48 100 87	50 101 28	Pittsburg, Pa.—May 21: Allegheny Traction Co	50		500,000		55 25	56
Detroit, Mich.—May 21: Detroit Citisens' Street Ry	100	250,000 1,000,000	1,200,000 250,000 1,000,000	•••••••	1003/ 175 90 	 100 110	Consolidated Traction Copfd.   pCentral Traction Co   qOitizens' Traction Co   rDuquesne Traction Co   sPittsburg Traction Co   Federal St. & Pleasant Valley Rv.	50 50 50 50	9,478 853 1,500,000 8,000,000 8,000,000 2,500,000	9,000,000 1900,000 18,000,000 18,000,000 1,900,000	3 %, Nov. 1 % % Nov. 6 % A.	123 64 4 69 124 	
Dayton OMay 21:  Oity Railway Cocom Oity Railway Copfd People's Street Railway	100		1,470,600 600,000		149 170 114	145 115	Pgh., Allegheny & Man. Trac. Co P'tisourg & Birmingham Trac. Ry. Pitisburg & West End Ry. United Traction Cocom United Traction Copref	50 25 50 50	8,000,000 1,500,000	1,500,000 8,000,000 17,000 000	2 %, Aug. 1 %, Oct. 5 % A., June	41 14 513/	12½ 11½

\*Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co of Baltimore. The pref. stock of U.R & Elec. Co. has been issued in the form of income bonds. b Leased to Boston Elevated Rairroad Company.

a Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Rapid Transit Company; road operated by Brooklyn Har, Co. f Block owned by Kings County Traction Company; road leased to Nassau Electric RR. g Owned by Atlantic Ave. RR and leased to Nassau system.

A 320 per share on outstanding capital paid as rental by leasee—West Chleago St. RR. Co., 250,100 of stock owned by North Chicago Street Railroad Company.

d Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

J 55 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company.

Majority of stock owned by Chicago West Division Railway Company; 5 % on \$1,000,000 stock guaranted by West Chicago Street Railroad Company.

Lailroad Company; \$625,100 of stock owned by West Chicago Street Railroad Company.

Majority of stock owned by Chicago Street Railroad Company, lessee.

Cinctuned St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

\*\* Unlisted. † Full paid. | Outstanding. † Ex-div. a Leased to New Orleans Traction Company at 6 % on stock. b Leased to New Orleans Traction Company at 8 % on stock. b Leased to New Orleans Traction Company at 8 % on stock and interest on bonds. d Operating the former Met. Trac. system, that corporation having become extinct. e Leased to Control of the former Met. Trac. system, that corporation having become extinct. e Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Ry. f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %. h Leased to Metropolitan Street Ry. for 99 years from Jani. 1, 1896, at \$215,000 per annum. i Leased to Metropolitan Street Railway for 18 % on stock until Oct. 1, 1897; thereafter. k Leased to Metropolitan Street Railway for 18 % on one of the following the



PASSE	PASSENGER RAILWAYS.								TELEPHONE AND TELEGRAPH COS.							
NAME.	Par	Capital Authors'd		Rate and Date of Last Div.	Ešd.	Asked.	name.	Par	Cacital Authors'd		Bate and Date of Last Div.	Bid.	) Andread,			
New Bedford Mass-May 21	100	\$850,000	\$850 000	2 %, Feb.	160	165	Boston, Mass May 21 American Bell Telephone Co	100	50 000 000	28 650 000	1½ % Q., Jan.	310	8101/2			
Northampton, Mass-May 21	1					]	Erie Telegraph & Telephone Co New England Telephone Co	.   100	• • • • •	••	1 % Q., Feb. 20, \$1,50 p. sh. Feb	104 184	101× 184×			
Northampton Street Bv Omaha, Neb May 21:	100	800,000	225,000	4 % A., June.	170	178	New York.—May 21:	. 100	14 000 000	14 000 000	1280	91	91			
Omaha Street Rv	100	5,000,000	5,000,000	8 % A. and N.	55	65	American Telegraph & Cable Co  *Central & South Am. Teleg. Co  *Commercial Cable Co  Franklin Teleg. Co	100	6,500,000 10,000,000	6,500,000	12 x q. 14 x q.	104 165	107 170			
Paterson By. Co	100	1,250,000	1,260,000	***************************************	54		Erie Telegraph & Telephone Co  #Gold & Stock Telg. Coguar. 6 %.	100 100 100	1,000,000 5,000,000 5,000,000	4,800,000	1; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;	112 118	52 1:8 128			
Providence, R. I.—May 21: United Traction & Electric Co	100	8,000.000	8,000,000	¾ %, Oct. '98	109	111	*International Ocean Tel Co.guar 6% Mexican Telephone Co *New York & New Jersey Tel. Co	100	<b>1 2</b> ,000,000			116	11n 8 23/4			
Philadelphia.—May 21 Fairmount Park Trans. Co 250 pd.	50	2,000,000	1,770,000	2 %, Dec. '19.	28	24	Pacific & Atlantic Telegguar. 4 %	25 100		15 000 000	2½ % Q., Jan., '99  2 % S.  1 % Q.	166	175 7 <b>5</b>			
nestonville, Man. & Fairmount Best'nvl'e, Man. & Fairm't6 % pfd. aFairmount Pk. & Had. Pass. By	50	1,968,100 588,900 800,000	11,966,100 1588,900 800,000	2% %, July 15, '\$9, 8 % S—July, '99, 8 % Feb. 1, '19.	47 75 75	48 76 76	Sout'n & Atlantic Telg. Oo.guar.5 % †Commercial Union Telegraph Co Western Union Telegraph Co	25 25	950,000 <b>500,00</b> 0	559,525 500,000	2½ % 8. 8 % 8., Jan., '99.	95 115	00 81¼			
Union Traction Co \$12% pd	50 50	80,000,000	29,930,450 8,297,920		361/4 845	863	†Div. guar. by Postal Teleg. Co.	•	••••	21,010,000	11/4 %, Q, Jan. '99.	81	0174			
dOitizens' Passenger Ry Frankford & Southwark Pas. R (Lehigh Avenue Ry. Co	50 50 50		11,875,000	\$8 share Q. \$14 sha'e A—Apr.\$9	450 48	451 	Miscellaneous.—May 21: American Dist. Teleg. (Phila.) Bell Teleph. Co. (of Canada.)	25 100	400,000 8,960,000		1 % Q.	26 188	87			
Lombard & South Street Ry	25 50 50	1,060,000	<b>†771,076</b>	A. & O. \$9 share A, Mar. 98	90 80 90	90%	Chesapeake & Potomac Telep. Co Chicago Telephone Co	100 100	••••		****	61 200	66 210			
¿People's Traction Co	50	1,500,000	572,800	8 %, A., April, '98. \$5.25 share—1898. 8 % Jan., 1898.	150 151	151 152	Central Dist Prig & Telg.Co.(Pgh.).   Empire & Bay States Telegraph Co.   Hudson River Telephone Co		• • • • • •	750,000 2,000,000	• • • •	148 75 120	150 76 125			
hPeople's Passenger Rycom.		1,500,000	740,000	•••••			*Northwestern Telegraph Coguar Providence (R. I.) Teleph. Co	50		2,500,000		124	125			
Philadelphia Traction Co	50	1,000,000	120,000,000 1400,000	\$2 p. sh., Oct. 98. 6 % A—Mar., '98. \$6 share—July, '98.	158	157	Southern New Eng. Teleph. Co	100	<del></del>		•		<u> </u>			
Continental Pass. Ryguar	50 50	000,000	1600,000	\$7 50 share July '98	208	2081/4	ELEOTRIO LIGHT	AN	DEL	CIRI	CAL MFG	. O	<u>08.</u>			
Philadelphia & Gray's Fy. E.E.	50 50	1,000,000 750,000	298,650	\$8.50 share July '98	8.8%	809	Boston, Mass.—May 21: Fort Wayne Electric trust receipts	<u></u>			••••	115	125			
Philadelphia & Darby Ky. guar.		• • • • • • • • • • • • • • • • • • • •	200,000 250,000	\$2 share July, '98. 11/2 % S., July, '98. \$11 sh. A., July, '98.	300	::	Ft. Wayne Elec Co. T. Sec. Series A. †General Electric Co. [old] com. General Electric Co. [new] "	100 100	40,000,000	80,460,000	2 % Q., Aug., 1898. 1% % Q., Jan., 1900	83	18 1854			
Thirteenth & 15th Sts. Pass. Ry. Union Passenger Ry. Co	50	1,500,000	1900.000	\$9.50 shre, July '98 \$10 share, July '98	200	240 268	TH. Elec. CoT. Secur., Series D. Westinghouse Elec. & Mig.Co.com.		10,210,000	145,700	••••	2×4	21/4 47			
Rochester, N. YMay 21	l		1,00,000				Westinghouse El. & Mfg. Co. pfd. Westinghouse El. & Mfg. Co. assent.	50	4,000,000 11,000,000	8,996,058 8,195,126	1% % Q., Jan.,	61 42	62			
Kochester Railway Co	100	5,000,000	5,000,000	*****	17	18	New York.—May 21; Edison Elec. Ill'g Co., New York	100	9,188,000	7,988,000		119	120			
Reading, PaMay 21  meading Traction Co	 50	1,000,000 850,000	1,000,000	Semi-an.,Jan. & Jy Jan., '98.	24 188	26	Edison Elec. Ill'g Co., Brooklyn	100 100	4,000,000	2,000,000	1% % Oct., '98.	8	iż			
(Kast Beading Riectric By	50		<b>‡1,000,000</b>		70	-	Electric Vehicle Oocom.   †General Electric Oo. [old]com.   General Electric Oo. [new]	100	40,000,000	80,450,000	2 % Q., Aug., 1898.	82	921			
St. Louis Mo May 21 Fourth Street & Arbenni Ey	50		150,000		-	<b></b>	Interior Conduit & Insulation Co  Kings Co. El. L. & P. Co	100 100 100	1,000,000	1,000,000 2,500,000	1½ % Q.,Jan., 1900.	185 41 110	125			
Jefferson Avenue Ry. Co Lindell Ry National Railway Co	100		2,400,000 2,470,000	2 % Dec., 1888. 1½ % Jan., '99. 1½ % Jan. '99.	::	••	Pittsburg, Pa May 21		· ·	2,000,000						
Cass Avenue & Fair Grounds	100	9 500 000	2,500,000 1,500,000	4 %. Oct., '98.	::	::	Liegheny County Light Co  East End Electric Light Co	100 50	500,000 800,000	500,000 800,000	J. & J. Q	168	172			
81. Louis RR	100	2,000,000 2,400,000	2,000,000 2,800,000	4 %, Oct., '98. 2½ %, Jan., '99. 1½ % Jan., '99. 50c., Dec., '89.	<del></del>		Philadelphia, Pa.—May 21 Edison Electric Light Co	100	2 000 000		*****	144	141%			
Pe pie's RR. Co	100	1 500,000	1 000,000	50c., Dec., '89. 8 %, Jan., '99.	28¾ 78	21 181	*Electric Storage Battery Cocom. *Electric Storage Battery Copfd.	100 100	8,500,000 5,000,000		•••••	80 74	80 Ja			
t. Louis & Suburban Ry	1 1000	2,500,000	2.500,000	8 % A., July, '(9	68	10	Northern Elec. Light & Power Co Southern Elec. Light & Power Co	10 10	550,000 187,500	550,000 187,500	••••	18 80	18%			
San Francisco, Cal May. C. difornia St. Cable RR			ļ		117	119	Miscellaneous.—May 21: Bridgeport (Conn.) Elec. Lt. Co	25	500,000		*****	47	48			
eary Street Park & Ocean KK	100	1,000,000 1,000,000 18,750,000	875,000	50c, monthly. \$2.50 share, '96. Q., 60c. per share.	50 61½	68%	Missouri-Edison (St. Louis)com.	25			••••	20 10	21 14			
Presidio & Ferries RR	100	1,000,000	550,000		••	16	Hartford (Conn.) Elec. Light Co Hartford (Conn.) Lt. & Power Co New Haven (Conn.) Elec. Lt. Cc	100 25 100	850,000 175,000 100,000	•••••	••••	150 6 195	15 t 10			
Scranton Pa - May 21 Beranton Rail way Co	50 100				29 16}	80	Narragansett (Prov., R.I.) Elec. Co. Bhode Island Elec. Protec. Co	50			2 % Q., Oct.,	9 <b>8</b> 1184∡	100			
m Scranton & Carbondale Trac. Co	100				••		Royal Elec. Co. (Montreal)		1,000,000 1,085,000	1,085,000	1% X Q	199 120¼				
Springfield III May 21: Springfield Consolidated By	100	750,000	750,000	*********	-		Thomson-Houston Welding Co Woonsocket (R. I.) Electric Co †On Aug. 17 last by a majority voi	100				105	100 106			
Springfield OMay 21 Springfield Street By	100	1,000,000	1,000,000		_	111	to \$20,827,200, of which \$18,276,000 is constructed the Edison III	comn	oon and \$2	,551,200 pr	eferred.	1 Ex	div.			
Springfield, MassMay 21		' '	_,	••••••			pany, the Municipal Electric Light	Co.								
pringfield Street Ry Toronto Canada May 21:	100	1,200,000	1,166,700	8 <b>% A.</b>	207	213	ALLIE	<u>U</u>	INDU	SIRIE	. <del>.</del> .					
Toronto Street Ry Montreal Street Bailway Co	100	6,000,000 4,000,000			9784 254	1 <sub>0</sub> 0 256	Boston Mass.—May 21: Delaware Gas Light Cocom.	50	500,000	500,500	J. <b>&amp;</b> J.	72%				
Washington, D. CMay 21:				-			Delaware Gas Light Copref. American Electric Heating Co Street Ry. & Illu'g Propertiespfd		10,000,000	200,000	J. & J. 32 p. sh. Jan. 26, '99	98				
Capital Traction Co	50 100 50	112,000,000	12,000,000	65c. per sh, Oct. 19.	1011/4	105	United Electric Securities Copfd.	100	2,000,000	1,000,000	8.50 p.sh, Nov'99		100			
Dolumbia Ry. Co	50	707,000	652,000		85 15	40 16	New York.—May 21: Consolidated Electric Storage Co				••••	8	12			
Metropolitan RR. Co	50			2% % Q.		••	Safety Car Heating & Lighting Co Worthington Pump Cocom. Worthington Pump Copfd	100		5,500,000			156 110			
Worcester Traction Cocom	100 100		8,000,000	8 % S., Feb., '96.	81 104	82 106	Philadelphia PaMay 21	100	2,000,000	2,000,000		100	110			
Worcester Traction Co6 % pfd. Worcester & Suburban Street Ry	1		542,500	4× ×, 1897.		85	Electro Pneumatic Trans. Co United Gas Improvement Coscrip.		10,000,000			23/4	162			
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1%, Jan.,	26	29	Welsbach Commercial Cocom. Welsbach Commercial Copfd. Welsbach Light Co	100 100 5	8,500,000 500,000 525,100		XQ		21 75 46¾			
Unlisted. † Paid in. † Full a Leased to Hestonville, Man	paid k Fai	l.   Outst	anding.	Ex-div. Rv. for 6 % on stock	per s	annum	Weisbach Light Co., Canada	5	500,000		••••	13%				
b Consolidation Electric, Pec- charges and all indebtedness of	1 1		41 3 1 14		7	774	Pittsburg, Pa.—May 31: Oarborundum Mfg. Co Standard Underground Cable Co	100	200,000	200,000		3	:09			
Traction Company. c Practically all shares owned d Lease to Frankford & South	by t	Union Trad	ction Com	pan▼.			Miscellaneous.—May 21:	196	1,000,000	1,000,000	9	90	192			
Leased to Electric Traction ( Controlled by Frankford & S	omp	pany. Iwark Pas	senger Ra	ilway.	.ac110	ш ∪0.	*Barney & Smith Car Cocom. *Barney & Smith Car Copfd.	100		1,000,000 2,500,000	ï X		17 10 <b>7</b>			
g Leased to People's Passenge: h Majority of stock owned by	r Rai Peor	llway at \$5 ple's Tract	per share ion Comp	any.			Billings & Spencer Co Consol. Car Heating Co	25 100	1,250,000	1,250,000	l% % Feb	82 55	58			
i Leased to Union Traction Oci j Lease transferred to Union T	mpa: racti	n <b>y.</b> Ion Comps	ny.		. 1	1984 7 4	Johns-Pratt Co	100	•••••	•••••	~~	2	109 4 50			
declared as a dividend semi-annu	per Bily.	annum 1	hereafter,	payable semi-ann	ally,	rental	Stillwell-Bierce Copfd.		*********		% Sept 1,'99.	I	50 65 90			
b Dividend of 10 % guaranteed Dividend of 6 % guaranteed	by R	Reading Tr	raction Co action Co	ompany. mpany.			St. Charles Car Co	100	500,000			50 80	10 106			
Leased and operated by the f	- 4201	vion Haliv	ray Ue., k	ormerly <b>Stranton</b> T	recti	M Co.	Valisted.	, ,		'	T .	•	1			

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# BONDS.

		-	-			_	-			6		-	grace and
	Amou	nt.		Interest				Ame			Laterest		
NAME.	Authorized.	Issued.	Due	periods.	Bid.	Asked.	HARR.	Authorized.	Issued.	Due		Bid.	Aufea
Albany N. Y.							New Orleans La. Date of Quotation- May 21, 1900.						
Date of Quotation-May 21, 1900							Canal & Claiborne RR cons mig. 5s. Crescent City RR	\$150,000	(\$150,000 50,00( §	1899	M. & N.	105%	***
e Albany Ry. Co Cons. mtg. 5s. ne Albany Ry. Co Gen. mtg. 5s. atervleit Turnpike & RR. 1st mtg. 6s	\$500,000 750,000	427,500 875,000	1947	M. & N.	*1171/2	1071	Orescent City RRCons. mtg. g. 5s. New Orleans City RR1st mtg. 6s.	5,000,000 416,500	8,000,000 899,000	1948	J. & J. J. & D.	108	iii
stervieit Turnpike & RR2d mtg. 68.	850,000 150,000			M. & N.	*128	127½ 127	N. Orl's City & Lake RRlst mtg. g. 5s. N. Orleans & Carrollton RR.2d mtg. g. 6s.	5,000,000 850,000	2,599,500 850,000 800,000	1907	F. & A.	112	111
y Oity Railway Co1st 5s	****	••••	1942	******	*116½	******	Orleans Railroad CoCons. mtg. 6s. 18t. Charles St. RR. Co1st. mtg. 6s.	800,000	75,000	1906	J. & D.		
Interest guar, by Albany Ry. Co. Principal and interest guar, by							†\$428,500 in escrow to retire New Or- leans City RR, Co.'s 1st mtg. bonds, 1\$90,000 outstanding.						
Baltimore Md.							New York.						
Date of Quotation- May 21, 1900							Date of Quotation-May 21, 1900. Atlantic Ave. (Brooklyn)lmp. g. 5s.	1,500,000	1,500,000	1984	J. & J.	95	
ited Electric Ry. Colst mtg. g. 4s	88,000,000 14,000,000	18,000,000	1949	J. & D.	102 748/4	1021/4	Atlantic Av. (Brooklyn). lst gen. mtg.5s.	8,000,000	759,000 1,966,000	1909 1931	M. & S. A. & O.	107%	11
timore City Pass. Rylst mtg. g. 5s. timore Traction Co 1st mtg. 5s.	2,000,000 1,500,000	2,000,000 1,500,000	1929	M. & N. M. & N.	1187/8 119	120	Broadway & 7th Ave. 1st cons. mtg. g. 5s. Broadway & 7th Ave.	1.500.000	7,650,000 1,500,000	1904	J. & D.	128 104	12
timore Trac. Co. Exten. & Imp. g. 6s, Trac. Co. No. Balto div. 1st mtg. g. 5s	1,250,000 1,750,000	1,250,000 1,750,000	1942	J. & D.	1041/2	121%	Broadway & 7th Ave2d mtg. 5s.	1,125,000	500,000 1,125,000	1924	******	108 115	11
l. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000 800,000	117 000	1900 1906	N. & M.	101		Brooklyn City RR Co. 1st cong. mtg. 5s.	6,000,000	1,000,000	1941	J. & J.	105 116	11
ntral Pass. Ry. Co1st mtg. 6s. ntral Pass. Ry. CoCons. mtg. g. 5s.	96,000 601,000	117,000 580,000	1982	M. & N.	119	121	Brooklyn City & Newtown1st mtg. 5s.	2,000,000 1,000,000	2,000,000 448,000	1933	J. & J.	115	11
ke Roland Elev.,	8,000,000 1,000,000	8,000,000 1,000,000	1922	J. & D. M. & S.	116	117	Brooklyn Heights RR1st.mtg.5s.	0.000.000	250,000 8,500,000	1941	J. & J.	104	
All of the bonds of the above				1			Brooklyn, Q's Co. & Sub'n. 1st cons. 5s. Brooklyn Rapid Transit	7,000.000	2,750,000 5,181,000	1945	*********	107	10
panies, marked t, have been as- ed by the United Railways & Elec-							Cent P'k. N. & E. R. RR 1st cons. mtg. 4s	1,200,000	700,000 1,200,000	1902	J. & D. M. & N.	101% 107 125	10
Company. Boston, Mass.							Coney Island & Brooklyn RR.1st mtg.5s	800,000	800,000	1908	J. & J. J. & D.	101	10
Date of Quotation- May 21, 1900	5 970 000	9 800 000	1994	J. & D.	114	115	D Dock, E. Bd'y & Bat'y R. gen, mtg. g.5s Dry Dock, E. Bd'y & Bat'y RRscrip 5 %. Eighth Av. RR. Co Oert. indebt. 6 %.	100,000	1,100,000	1914	F. & A.	102	10
nn & Boston RRlst mtg. g. 5s. st End Street RyDeben. g. 5s.	8,000,000	8,702,000 8,000,000 2,000,000	1902	M.& N. M. & S.	1041/4	106	42d St., Man. & St. Nich. Av1st mtg. 6s. 42d St., Man. & St. N. Av2d mtg. inc. 6s.	,200,000 1,500,000	1,200,000	1910 1915	M. & S. J. & J.	11614	11
t End Street RyDeben. g. 4\%s. 1,674,000 in escrow to retire outstand- bonds of absorbed companies.	2,000,000	2,000,000				1000	Lex. Ave. & Pav. Ferry RR.1st mtg. g.5s. Metropolitan St Rv Co., g. m. cl. tr. g.5s	5,000,000 12,500,000	5,000,000	1993 1997	M. & S. F. & A.	124 120	1
Charleston S. C.							Second Avenue Ry Gen cone mtg 5g	1,600,000	1,600 000	1909 1909	M. & N. J. & J.	120	15
Bate of Quotation- May 21, 1900.	T						Second Avenue Ry Deb. 5s. Steinway Ry. (L. I.) 1st mtg. g. 6s. South Ferry RR. Co 1st mtg. 5s.		1,500,000 850,000	1919	*****	116	11
terprise Street RRlst mtg. 5e. arleston City Rylst mtg. 6s.	500,000 850,000	47,000	1906	J. & J. J. & J.	106		Third Avenue RR	5,000,000	5,000,000	1987 1909	J. & J. J. & J. J. & J.	******	12
ontrolled by Charleston St. By .Co	330,000						Union (Huckleberry) Rylst mtg. 5s	2,000,000	2,000,000	1942	F. & A	106 118	10
Chicago III.							ttWestchester Electric RRIst mtg. 5s. †\$1,085,000 in escrow to retire gen. mtg.	000,000	500,000	1948	J. & J.	110	1
Date of Quotation-May 21, 1900 cago City Rylst mtg. 4%s.	6,000,000	4,619,500	1901	J. & J.	1013/4	21/4	bonds. 184,850,000 in escrow to retire maturing	100					
cago Passenger Rylst mtg. 6s. cago Passenger RyCons. mtg. 6s.	400,000 1,000,000	400,000 600,000	1908 1929	F. & A. J. & D.		102							
cago & So. Side R. Tlst mtg. g. 5s.	7,500,000 1,500,000	7,500,000 750,000	1929 1907	A. & O. J. & J.	::::	••••	mtg. bonds.					95	
icago West Div. Rylst mtg 41/8. ce Street Elevated RRlst mtg. g. 5s.	4,040,000 7,574,000	4,040,000 8,781,200	1932 1928	J. & J. J. & J.	108%	109	tt Guar. by Union Ry. Co. Toronto Canada.						
rop, W. Side Elev. Rylst mtg. g. 5s. th Chicago St. RRlst mtg. 5s.	15,000,000 3,171,000	15,000,000 3,171,000	1942 1906	F. & A. J. & J.	96 106	96%	Date of Quotation-May 21, 1900.	12.2.1.		100	Wen	Total X	
th Chicago St. RR Cert. indeb. 6s. th Chicago City Ry1st mtg. 6s.	500,000	500,000 500,000	1911	J. & J. J. & J.			Montreal St. Rylst mtg. 5s. †Toronto St. Rylst mtg. g. 4½s.	2,500,000 4,550,000	800,000 2,200,000	1908	M. & S. M & S.	****	***
th Ohicago City Ryconsol. 4%s. of Chicago St. RR1st mtg. 5s.	2,500,000 4,100,000	2,500,000 8,969,000	1927 1928	M. & N. M. & N.	108	111	†\$85,000 per m. single track authorised. \$600,000 in escrow to retire 5s due in 1901						
st Chicago St. RR Deben. 6s et Chicago St. RR Con. mtg. g. 5s	2,700,000 12,500,000	5,000,000 6,000,000	1911 1986	J. & D.	101 1065/8	102 107	Philadelphia.						
Chicago St. RR. Tunnel 1st mtg. 5s. tedeemable at option on 60 da. notice.	1,500,000	1,500,000	1909	F. & A.		••••	Date of Quotation-May 21, 1900			1000	,		
unded debt assumed by Chicago W. Ry. Co., controlling interest of							Continental Pass. Bylst. mtg. 6s Empire Pass. Bylst mtg. 7s	ROO OOO			J. & J. J. & J.	****	***
ch is owned by W. Chicago St. RR. lessee.							Greene & Coates St. Ry	150,000	100,000	1901	0.000.	:	***
ubject to call after Oct. 1, 1899, at and interest.							People's Pass. Ry2d mtg. 7s	500,000	250,000 458,000	1911	J. & J. J. & J. M. & S.	::::	**
nt. guar. by W. Chi. RR. Co., lessee.							People's Pass. ByStk. trs. cert. 9. 4s.	5.698.210		1948	1 %	::::	
Cincinnati, O.	1		1				Phila. City Passenger RyIst mtg. 5s. Philadelphia Trac. CoColl. tr. g. 4s. Thirteenth & 15th St. RyIst mtg. 7s.	1,800,000	1,018,000	1917	F. & A. & O		
Date of Quotation-May 21, 1300	9 000 000	9 500 000	1000	TAT	118%	114%	Union Passenger Ry	500,000	100,000 500,000	1911	A. & O. A. & O.		***
New. & Cov.St. Ry. 1st Con.mtg. g.5s. Adams & Eden P'k In 1st mtg. 6s. Adams & Eden P'k In 1st mtg. 6s.	46,000	2,500,000 46,000	1900	A. & O.	1081/9	104	West End Passenger Ry 'stmtg.7s. West Phila. Pass. Ryls. tg. g. 6s.	250,000	246,000	1905	A. & O.		
Adams & Eden P'k In1st mtg. 6s. Adams & Eden P'k Inc. Cons. mtg. 5s Oov. & Oin. St. Ry1st mtg. 6s.	100,000 581,0%0 250,000	100,000 581,000 250,000	1904		1083/4	1221/6	West. Phila. Pass. Ry	750,000	750,000	1926	M. & N.		
Oov. & Cin. St. Ry2d mtg. 6s. Assumed by the Cincin. St. Ry. Co.	400,000	100,000	1982	J. & J.	12i % 182¾	187	pay for the shares of the Electric and People's Traction lines purchased.						
250,000 reserved to retire 1st mtg. bds.							Pittsburg, Pa.						
Cleveland, O.  Date of Quotation- May 21, 1900							Date of Quotation - May 21, 1900.	F00 000	1	1001	W . c	1111/	
ooklyn Street RR. Colst mtg. 6s.		600,000	1903	M. & S.	106%	107	Birmingham, Knox & Allentown68. Central Traction Co1st mtg. 58.	875,000	875,000	11980	M. & S. J. &. J	1111/2	:::
New't & Cov. St. Ry. Cons. mtg. 5s. veland City Cable Ry lst. mtg. 5s.	8,000,000 2,000,000	2,500,000	1922	J. & J.	105 1/2	114%	Citizens' Traction Co1st mtg. 5s.	1,250,000	1,250,000	11980	A. & O. J. & J.		
veland Electric Ry.Co. 1st mtg. g. 5s. imbus (O.) Cent. Ry 1st mtg. g. 5s.	1,500,000	1,249,000 1,500,000	1918 1918	M. & S. M. & N.	106	107	*Fed'l St. & Pleas. Val. Jack's Run5s. Fed'l St. & Pleasant ValleyCons. 5s.	1 1.250.000		1942	J. & J. J. & J. M & N	110	1
st Cleveland RR	600,000	1,000,000	1910	M. & S. M. & N.		1071/2	Millvale, Etna & Sharpsburg58. Pittsburg, Crafton & Mansfield58. Pittsburg Traction Co.	250,000	250,000	1924	M. & N. J. & J.		
ain (O.) Street Rylst mtg. 6s. Ry. Oo., Grand Rapidslst mtg. 5s.	200,000 600,000	200,000	1915	J. & J. J. & D.		::::	Pittsburg Traction Co	1.500.000	1,500,000	1929	A. & O. M. & N. J. & J.	112	113
1,900,000 in escrow to retire bonds of orbed companies, marked a.							*Pg'h., Allegh, & ManchGen mtg 5g	1,500,000	1,400,000	1980	A. & O.		*10
nterest guar. by Cons. St. Ry. Co. Detroit, Mich.							Second Ave. Traction Co58. Sub. Bapid Transit Railway Co68.	2,500.000 500,000	2,000,000 500,000	1918	Y & B.	*****	
Date of Quotation-May 21, 1900 troit Citizens' St. Rylst mtg. 5s.	7 000 000	9 Com 22-	,	4 40		1001	Providence R. I.						
Wayne & Belle Isle By 1st mtg. 6s.	400,000		1902	A. & O.	105	1021/2	2 die of Guerranois Mary 21, 1200.						
Detroit Ry	1,800,000	1,800,000	1925	J.&D.	105	1061/2	Newport Street RyCoupon 5s United Trac. & Elec. Colst mtg. g. 5s	9,000,000	50,000 8,260,000	1910	J. & D. M. & S.	116	"ii
New Haven Conn.		G.					St. Louis.		,,				1
Date of Quotation- May 21, 1100.	****	***					Date of Quotation-May 21, 1900.						
w Haven St. Ry1st mtg. g. 5s. w Haven (Edgewood Div.)1st.mtg.5s.	600,000 <b>25</b> 0,000	250,000	1914	M&S J&D	111 111		Baden & St. Louis RRlst mtg. 5s. Cass Ave. & Fair Gds Rylst mtg. 5s.	1.600.000	250,000 1,600,000	1912	J&J	100	10
nehester Avenue RR—lat mtg. g. 5s. Inhester Avenue RRDeben. g. 5s.	100,000	\$00,000 34,000			109		Citizens' Railway Colst mtg. 5s. Comp. Hts. Un. De. & Mer. Terlst	2,000,000 1 000 000	1,500,000	1907	J&J	109	10

PASSENGER RAILWAY.								
WAND.	Ame Authorized.		Due	Interest periods.	Bid.	Askod.		
St. Louis.		1	<u> </u>					
Date of Quotation— May 21, 1100,	400,000	400,000	1906	M. & N.	108	106		
Jefferson Avenue Bylst mtg. 5s. Lindell By. Colst mtg. 5s Missouri RB. Co	1,500,000 1,000,000	1,500.000	1911	F. & A. M. & S.	106 105	109 106		
Mound City KK. CoIst mig. 0s.	125,000	800,000 125,000	1910 1902	J. & D.	100	102		
People's RR. Co	1,000,000	800,300	1902 1904	J. & J.				
MI. LOUIS K.K. UD	a,000,000	2,000,000 1,400,000	1900 1900 1921	M. & N.	100   995   108	101 100 104		
18t. Louis & Sub. Ry	800,000	800,000 500,000	l	M. & N.	80 106	84 108		
Taylor Avenue St. Rylst mig. g. 6s. Union Depot RR. Colst cons. mig. 6s.	1,091,000	500,000 1,091,000	1918 1900	J. & J. A. & O.	116 100	118 1005		
Union Depot RB. CoCons. mtg. 6s. †Controlled by St. Louis RB. Co.	8,500,000	1,787,000	1918	J. & J.	121	122		
Controlled by Union Depot RR. Co. Controlled by Lindell RR. Co.	!							
is 200,000 in escrow to retire 1st & 2d mtg.  3500,000 in escrow.  112200,000 in escrow to retire 1st mtg.	1							
] (0			ł					
San Francisco Cal.	j							
Date of Quotation—May, 1900. California St. Cable RBlsi mig. g. 5s.	1,000,000 650,000	900,000 650,000	1915	J. & J. M. & S.	114	117		
† Ferries & Cliff House Bylst mtg. 6s. Geary St., Park & Ocean RBlst. mtg. 5s. Market St. Cable By. Colst mtg. g. 6s.	1,000,000	671,000 8,000,000	1921 1918	A. & O.	126)	95		
Metropolitan By. Colst mig. 6s.	200,000	2,000,000	1918	A A O	126%			
Park & Cliff House BBlst mig. 6s.	850,000	850,000 250 000	1912 1914	J. & J. J. & J.	105% 115	107		
†Powell St. Bylst mtg. 6s.	700,000	700,000 900,000	1912 1918	M. & S. M. & N.	•••	125		
tControlled by Market St. Ry. Co. Washington D. C.	ļ							
Date of Quotation-May 21, 1900	500,000	450,000	1920	J. <b>&amp; J</b> .				
Belt Ry. Co		500,000 200,000	1914 1911	A. & U.	182	•••••		
Metropolitan BR. CoColl. tr. cons. 6s. 1250,000 in escrow to retire 1st mtg.bds.	900,000	500,000	1901	J. & J.		•••••		
Miscellaneous.			1					
Date of Quotation—May 21, 1900.  Bridgeport Traction Co	2,000,000	1,688,000			108	110		
Buffalo (N. Y.) By. CoCons. mtg. 5s.	4,000,000	8,548,000 8,000,000	1988	M. & N.	118 104	103		
¡Orosstown St. Ry. (Buffalo)lst. mtg.5s. ¡Columbus (O.) St. Rylst cons. g. 5s. Consolidated Traction (N. J.)lst mtg.5s	8.000.000	2,866,000 2,261,000	1982	J. & J.	112 115	118		
(Crosst'n St. Ry. (Colu's, O.)lst mtg.g.5s Denver City Cable Rylst mtg. g. 6s.	2.000.000	18,965,000 572,000 8,800,000	1988	J. & D.	1111/4	111% 1167		
Denver Con. Tram'y CoCon. m. g. 58.	4,000,000	922,000 4.981.000	1988 1980	A. & O.	20 80 119	85 1193		
Minneapolis St. Rylst cons. mtg. g. 5s †No. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	5,000,000 8,000,000	1,050,000 2,878,000	1928	J. & J. J. & J.	110¼ 108	110%		
Minneapolis St. Rylst cons. mig. g. 5s f No. Hudson Co. Ry. (N.J.). Cons. mig. 5s. No. Hudson Co. Ry. (N.J.) Deb. 6s. No. Hudson Co. Ry. (N.J.) Deb. 6s.	550,000 500,000	550,000 489,000	1902	M. & N. F. & A.	<b>:</b>	•••••		
Paterson (N. J.) ByCons. mtg. g. 6s. *cochester (N. Y.) Bylst mtg. 5s. St. Paul City RyCons. g. 5s.	8.000.000	1,000,000 2,000,000 4,298,000	1980	J. & D. A. & O.		100		
St. Paul Olty ByDeb. g. 6s.	1,000,000	1,000,000	1900		105¾ 108	106		
181,000,000 in secrew to retire 1st and d mig. bds.								
1\$800,000 in treasury. Bonds guar. by Ruffalo By. Co.								
19760,000 in escrow to retire bonds of . C. St. RR. Co.								
\$87,000 in treasury. \$8960,000 res'ved to redeem prior liens. \$820,000 in escrow.	İ							
	<u> </u>	<u> </u>			*Wish			
Poston Mass	U ELE	OTRIC	AL	. MF(	<i>a.</i> 0	08,		
Boston, Mass Date of Quotation—May 21, 1900.								
Delaware Gas Lt. Co.,lst m. 5s, g. Edison Elec. Illuminating Co., Boston	800,000 2,026,000	800,000		J. & J. Quar.	106	•••••		
General Electric Cogold coup, deb. 5s Pittsburg Pa	10,000,000	8,750,000	1923	*********	116	*****		
Date of Quotation— May 21, 1900 Allegheny County Light Co	500,000		1911	J. & J.	110	******		
Westinghouse Elec. & Mig. CoScrip 6s.	195,570			M. & S.	••••	•••••		
Miscellaneous.—( May 1, 1900.) E tison El. Illg. Co. (N. York) 1st m. 5s E lison El. Illg. Co. (N. Y.) con. m. g. 5s.	4,812,000	4,812,000	1910		109			
K lison Kiec. Hig. Co. (Brooklyn)	5,400,000	2,188,000 5,000,000	1998 1940		124 1221 <sub>4</sub>	124		
E lison Electric Light (Philadelphia) Kings Co. El. Lt. & Pow. Co.lst mtg. 5s. Kings Co. El. Lt. & Po. Co.pur. money 6s	2,000,000 2,500,000 5,176,000	2,500,00 5,176,00	1987 1997	A. & O. A. & O.	100 120	101 122		
Milwaukee El. By & Lt. Co.1st con. g. 5s. United Elec. Light & Power Co(N. Y.)	8,000,000 5,000,000	6,103,0		F. & A.	1023			
TELEPHONE		TELEG	R	APH.				
Miscellaneous.  Date of Quotation—May 21. 1900.					1001/4	<b>10</b> l		
American Bell Telephone	********	*****	1908	F. & A.		• • •		
Northwestern Telegraph Co			 1 <b>91</b> 1	J. & D.	114	106		
ALLIED	INDU	BTRIE	8.					
Miscellaneous.	<u> </u>	1	1	1	ĺ			
Date of Quotation—May 21, 1100 American Electric Heating78.	500,000	600.000						
Armington & Sims Engine Co	*******	********	1942		106	25 107		
Carborundum Mig Co6s. Worthington_Pump Co6s.	75,000	********	1904	J&D.	115	127		
Unlisted †Nemina	M.							

# NOTES FOR INVESTORS.

Late quotations for copper are : Electrolytic,  $16\S@16\Sc.$ ; Lake,  $16\S@17c.$ ; casting,  $16\S@16\Sc.$ 

Traffic of the Metropolitan Elevated (Chicago) for two weeks in May has increased 18 per cent. Operating expenses are under 40 per cent. of gross earnings.

The production and exports of copper for the month of April shows a total output by domestic mines of a little over 24,000 gross tons, and by foreign mines of over 7,300 gross tons.

The Consolidated Electric Company of Philadelphia has secured control of the electric lighting plants in Oil City and Franklin, and is negotiating for the Smithman Street Railway of Oil City.

A special meeting of the stockholders of the Southwestern Telegraph and Telephone Company will be held in New York City on June 12 to vote on a proposed increase of capital stock from \$7,000,000 to \$10,000,000.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 20@23; New York Electric Vehicle Transportation, 8@9, New England Transportation, 4@5; Gramophone, 4(@50.

A mortgage sale of the plant, franchise, etc., of the Kalamazoo Heat, Light, & Power Company of Kalamazoo, Mich., was made to Chicago parties recently for \$38,000. This ends a long drawn out litigation for the possession of the plant.

The Bath Gas and Electric Company of Bath, Me., which has been in the hands of assigness since August 30, 1898, has been sold to George F. West of Portland, Me., for \$14.500. There are \$125,000 of first mortgage bonds out, and \$90,000 of second mortgage bonds.

The Amsterdam (N. Y.) and Hagaman Traction Company has been organized. This company proposes to distribute the electric power generated by the Empire State Power Company at Amsterdam. It will also operate street railways. The capital stock is \$100,000, divided into 1,000 shares.

The issue of North Chicago Street Ruilroad 6 percent, certificates of indebtedness to the amount of \$298,000 issued January 1, 1891, but subject to call at par, have been called for payment. Interest will cease July 1 next. This makes \$413,000 North and West Chicago debentures retired since the Union Traction Company secured control of these properties.

The Susquehanna Traction Company, which was organized at Lock Haven, Pa., on May 8, will take charge of the Lock Haven trolley line, which was recently sold at receiver's sale for \$34,700. The capital stock of the new company will be \$200,000. There will be a bond issue of \$100,000 of which \$75,000 will be expended in cancellation of old debts for repairs.

Some changes have been made in the management of the North Jersey Street

Some changes have been made in the management of the North Jersey Street Railway Company, which has its headquarters in Jersey City. Vice-President and General Manager David Young has appointed Harry W. Fuller assistant general manager. This was done by authority of the Executive Committe of the Board of Directors with a view of relieving Mr. Young of some of his arduous duties.

Stockholders of the Consolidated Traction Company of Pittsburg will vote June 20 upon a modified proposition to lease the road to the new Union Traction Company. The preferred dividend rental is limited to 6 per cent. under the new terms, and it was the higher return proposed originally that caused objection from common shareholders. Preferred and common stockholders may subscribe to 40 per cent. of stock of the new company.

The annual meeting of the stockholders of the Anaconda Copper Mining Com-

The annual meeting of the stockholders of the Anaconda Copper Mining Company was held in Anaconda last week. Nearly all the stock was represented by proxy. The only matter that came before the meeting was the election of a board of trustees. It is comprised as follows: Marcus Daly, H. H. Bogers, Wm. Rockefeller, Albert C. Burrage, Wm. J. Bull. Wm. G. Rockefeller, E. C. Bogert. The trustees will meet next month in New York to elect officers.

trustees will meet next month in New York to elect officers.

At a meeting of the directors of the Kings County Electric Light and Power Company, held on the afternoon of May 16 at 54 Wall street, New York, a quarterly dividend of 1½ per cent. on the issued capital stock of the company out of the earnings for the past three months payable June 1 was ordered paid. Transfer books closed May 21 and reopen June 1. This dividend is at the rate of 6 per cent. per annum. At a meeting of the directors a week previous the reports presented of the business standing of the company showed that the earnings amounted to 12 per cent. of the capital stock, of which there is \$2,000,000 issued.

per cent. of the capital stock, of which there is \$2,000,000 issued.

The Citizens' Railway, Light & Power Company of Hampton Roads, Va., which was incorporated on May 1 with \$2 0,000 of capital stock as a consolidation of the Peninsula Railway Company, the Peninsula Electric Light & Power Company and the Chesapeake & Hampton Roads Railway Company, has made a mortgage to the Maryland Trust Company of Baltimore, as trustee, to secure \$800,000 bonds. The present issue of stock is \$200,000, as above stated, but this can be increased under the articles of incorporation to not exceeding \$500,000. The Newport News and Old Point Railway & Electric Company controls the Citizens' Company and it is understood will guarantee that company's bonds.

The Metropolitan stockholders at a meeting on the 17th inst. approved the

derstood will guarantee that company's bonds.

The Metropolitan stockholders at a meeting on the 17th inst. approved the Third Avenue lease as well as the proposition to issue \$7.000,000 additional capital stock. Over 339,000 shares of stock were represented. All the property, including franchises, of the Third Avenue Railroad Company was covered by a mortgage which was filed with Register Fromme on May 18 in favor of the Morton Trust Company, as trustee, for \$35.000,000 The mortgage is made to secure an issue of 5 per cent. gold bonds maturing in 1937. The stockholders and the Board of Directors of the Third Avenue Railroad Company, at meetings held on May 11, voted to sanction the issue of bonds, to cover which the mortgage was given to the Morton Trust Company.

We understand, "ays the Boston "News Bureau," that the terms under which 6,000 shares of the South Shore & Boston Street Bailway Company stock, out of 6,900 shares, were sold to the Massachusette Electric Companies, were one share of Massachusette Electric Companies preferred stock and three-fourths share of common for each share of stock of the South Shore & Boston road. This exchange of stock will not take place until August although the Massachusetts Company is already in control of the road. G. A. Fernald & Co., who effected the sale, has arranged to secure for the minority holders the same terms at which a sale of a majority of the stock was made. It is estimated that through this consolidation a saving of \$20,000 per year can be effected from the start, which would be equal to 3 per cent, on the outstanding stock of the Suth Shore road. 3 per cent. on the outstanding stock of the South Shore road.

A newspaper report from Boston says: The New England Electric Vehicle & Transportation Co. is still in a transition state. It has passed the experimental stage, but pending the delivery of an adequate number of vehicles the company is not in a position to show its true earning capacity. The company is making very handsome gress earnings per vehicle, but its operating expenses per vehicle are extraordinarily high, owing to the fact that it requires practically the same amount of station apparatus for fifty or sixly vehicles as for many times that number. Then again it is now obliged to do its charging and renewing of batteries by hand, whereast it is proposed to do all this by machinery at a great saving in expenses. It is not expected that the company will be in a position to give a good account of itself until autumn, for by that time it will have between 300 and 400 vehicles in commission, including 100 cabs, 100 delivery wagons and 100 open vehicles.



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# PLECTRICITY

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THE TRADE SUPPLIED BY THE AMERICAN NEWS COMPANY.

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# EDITORIAL NOTES.

The Twenty-third Convention of the

The Twenty-third Convention of the National Electric Light Associa-National Electric tion, which has just Light Association. drawn to a close, was probably the most suc-

cessful yet held-at least such would seem to be the concensus of opinion. Most of the papers read and subjects touched upon were of a high order and are valuable additions to the literature already published on those subjects. The reports especially were more complete and contained more precise information than has generally speaking heretofore been the case, that on the "Photometric Values of Arc Lamps," deserving special mention.

An important step, and one that is to be commended, was also taken by the Association in indorsing the standardization of electrical apparatus adopted by the American Institute of Electrical Engineers. Lieut. Cahoon's paper on a "System of Uniform Accounting," and the discussion which followed also deserve special mention.

Excellent judgment was exercised in the selection of officers for the ensuing year, especially in Mr. J. B. Cahoon for president. Mr. Cahoon, as will be seen by a glance at his biography, which is to be found on page 326, has had a wide and extensive experience in the electrical field, and especially that pertaining to central station plants, which should redound to the benefit of the Association.

The attendance was everything that could be desired, there being about three hundred and fifty delegates and visitors present, not including some twenty ladies.

The proceedings in full will be found elsewhere in this issue.

Electricity Versus Steam for Ocean Liners.

Owing to the fact that electricity is extremely flexible and easily adapted to very many purposes a large number of persons

appear to labor under the delusion that it can be applied economically and efficaciously wherever power is needed. Such, however, is far from being the case, for as every one knows everything in this world has its limitations, and the electric current is no exception to this rule. Thus up to the present it has been found impossible to apply electricity to the propulsion of ocean-going steamers, owing to the excessive weight the necessary storage batteries would entail. Granted there are several small ships driven by electricity, the largest of these plying, if we are not mistaken, on the River Mersey, in England, which, however, is scarcely more than a good size tug boat, being but 75 feet in length. In view of this fact and the present state of the art, it is, to say the least, rather surprising to hear people talk of the early possibility of journeying from New York to Liverpool in an electrically-driven ocean liner. But this is just what is happening and that is inferred in an article which has been going the rounds of the daily papers during the past week. The article in question is amusing, principally on account of its inaccuracy. The author-whoever he is-compares the weight of an ordinary steam plant in an ocean liner of 10,000 horse power with an electrical plant of similar capacity, and either through an inexcusable oversight, or by a deliberate juggling of figures, makes it appear that the necessary electrical apparatus would weight but little more than the steam engines, boilers and coal. The article says:

"On the important question of relative weight, some approximate data are already available. Summing up the weight of engine, boiler and fuel on board and dividing the aggregate by the horse-power of the engine will give the weight of the material per horse-power for the transatlantic trip. Were this figure in any way comparable to the weight of battery and motor per horse-power, the question then to decide would be whether to carry power on tap ready for immediate use, at what would presumably be a higher figure, or carry coal, with engines, boiler, etc., according to the present practice. A rough estimate as to the weight of the steam plant on board an average ship would show that 6,000 tons of coal added to the weight of the engines and boilers would give in round figures an aggregate weight of 10,000 tons. A storage battery capable of giving 10,-000 horse-power for six days would weigh, on the basis of seventy-five pounds per horsepower an hour, 75 times 10,000 times 24 times 6, divided by 2,000 equal to 9,000 tons. Making an allowance of 2,000 to 3,000 tons for motors, with their appurtenances, a fair balance would be struck of 12,000 tons weight of electrical machinery, against 10,000 tons weight of steam appliances. Even if the cost of operating electrical machinery were no less than that involved in the use of steam, it would give many advantages, such as increased space, available for cargo or passengers, a simpler method of operating the ship and in all probability an ultimate gain to the owners through saving in power caused by poor stoking. So that while the electrical navigation of ocean steamships is not yet assured, from the attention it has recently received it would seem to be in a likely way to be the subject of early investigation in electrical circles."

Ten thousand tons for steam plant and fuel as compared to twelve thousand tons for storage batteries and appliances would really be very satisfactory, and would augur an early solution of this problem. Unfortunately, the author of the article in the figures given has figured on the weight of batteries for one day and not for six days. For with the figures given,  $75 \times 10,000 \times 24 \times 6 = 108,000,000$ , and divided by 2,000, to reduce to tons, gives 54,000 tons, and not 9,000 tons as the article has it. This rather changes the aspect of affairs, and impresses one with the fact that the weight of storage batteries will have to be materially reduced before it will be either necessary or advisable to relegate to the scrap heap the triple or quadruple expansion steam engines now in use on ocean greyhounds.

#### \* \* \*

The
Proposed
National
Standardizing
Bureau.

The Committee on Coinage, Weights and Measures, to whom the House of Representatives in Washington referred the bill to establish the national standardizing bureau, has given the sub-

ject careful consideration, and has strongly recommended the passage of the bill. The committee has pointed out the fact that the introduction of accurate scientific methods into manufacturing processes, necessitates the use of a far greater variety of accurate standards and standard measuring apparatus than was formerly required, and enormous commercial transactions are based daily upon the reading of measuring apparatus, inaccuracies of which involve great injustice, financial loss, and expensive litigation. At present a large proportion of the scientific apparatus used by our schools, colleges, universities and laboratories is imported, and our manufacturers of these instruments cannot compete with the manufacturers of other countries without the facilities of a suitable standardizing laboratory. The extensive scientific work carried on in the laboratories of the different departments of the Government requires the use of many standards and instruments of precision which cannot be procured or tested in this country, thus involving great loss of time, inconvenience, and lack of uniformity.

The great interests above mentioned are compelled at present to utilize the far superior standardizing facilities of other Governments, and the advantage to be gained in each case alone would warrant the establishment of the proposed institution. It is therefore the unanimous opinion of the committee that no more essential aid could be given to manufacturing, commerce, the makers of scientific apparatus, the scientific work of the Government, of schools, colleges and universities than by the establishment of the institution proposed in the pending bill.

Furthermore, it is eminently fitting and proper that at the close of a century remarkable for its scientific discoveries and the de-

velopment, we should show our appreciation of the labors of those careful, devoted seekers of the truth to whom we are indebted for the discovery of the fundamental laws and principles upon which our daily health, comfort and prosperity depend, and who, as teachers and investigators, have won for our country a place second to none in the scientific world, by the establishment of the proposed institution, which they have unanimously requested. It is believed that the expenses of maintaining this institution, if properly administered, will be largely repaid by fees resulting from its work.

In view of these facts the committee strongly urged the enactment of the pending bill.

It is interesting to note that the National Electric Light Association adopted a resolution in favor of the passage of the bill.

\* \*

The Inter-State and West Indian Exposition.

From all indications there will be two expositions in this country in 1901 worthy of note, namely, that at Buffalo,

known as the Pan-American, and one in South Carolina, which will go under the name of the Inter-State and West Indian. The latter it is thought will fittingly illustrate the marvelous development and resources of the United States, particularly the Southern portion, during the nineteenth century, by a display of the arts, industries, manufactures, and products of the soil and sea. This proposed exposition will be held at Charleston, S. C., beginning December 1, 1901, and terminating May 1, 1902. The fact of its being held at no great distance from the islands of Cuba and Porto Rico should prove of benefit to the commercial interests. not only of this country, but of those islands as well. The exposition was originally projected to display the manufactures and industries of South Carolina, but so much interest was evinced in the affair by the citizens of other States, that it has been found necessary to enlarge its plan and scope, and it is now contemplated that every State and territory in the Union will have a place either among the collective exhibits or in the group of State buildings. Negotiations are being conducted with the Government for a large and comprehensive exhibit from Cuba and Porto Rico, and there will also be exhibits from many foreign countries. It is proposed to make a special feature of electrical appliances of all kinds. electric machinery and its adaptation to the various industries peculiar to the Southern States, while in the transportation section special attention will be given to the exhibit of automobiles.

The sequel of expositions in this and foreign countries has almost invariably been increased trade, immigration and prosperity, and in view of these facts the coming exposition will undoubtedly do much toward calling the attention of the world to the resources of the South. That electrical manufacturers will be well represented there is little doubt, as by so doing they will ultimately participate more fully in the large and growing trade of the Southern States

By direction of Gen. Wilson, chief of engineers, a board of engineer officers has been convened at the War Department at Washington for the purpose of considering and reporting a uniform system of electric plants at the various seacoast fortifications. These plants are used for the manipulation of ordnance ma-

chinery and for illuminating purposes. They are not all of the same character, and it is the province of the board to suggest the best general system for adoption at all the fortifications. The board consists of Major S. S. Leach, from New London, Conn., First Lieut. James B. Cavanaugh, from Mobile, Ala., and First Lieut. Robert R. Raymond, from Boston. These officers have all been closely indentified with the construction of fortifications for some time past, and are considered eminently qualified to pass upon the questions submitted to the board.

# UNDER THE SEARCHLIGHT.

# Notes and Comments on Various Topics.

THE Ohio Electric Association has decided to hold its next annual meeting at Put-in-Bay, and elected the following officers: President, Dr. J. K. Scudder, Cincinnati; first vice-president, Dr. T. D. Hollingsworth, Creston; second vice-president, D. Clotts, Gahanna; corresponding secretary, W. N. Mundy, Forest; recording secretary, W. S. Turner, Waynesfield; treasurer, R. C. Wintermute, Cincinnati.

Instruction in the operation of wireless telegraph instruments will be given the class of naval officers which is to be formed at Newport, R. I., during the coming summer.

THE first white lead mill to be driven entirely by electricity is at Port Richmond, N. Y. It has a capacity of 5,000 tons of white lead per annum, and is said to be a model of compactness and convenience.

St. Louis, Mo., is not the only place subject to street car strikes, for advices from Germany state that about 5,000 street car employes have gone on strike in Berlin, and are doing no little damage.

A CABLE dispatch from abroad states that Mr. Marconi, the wireless telegraphy expert, sailed last Saturday on the American liner St. Paul for New York. It is also stated that he is coming to the United States for the purpose of carrying out experiments in wireless telegraphy on a very much larger scale than has ever been done before. It is further interesting to note that on May 22 two more patents were taken out by Mr. Marconi in this country on wireless telegraphy apparatus, one of the claims of which reads as follows: "The combination of the primary and secondary of a sparking appliance, a battery in circuit with the primary, an aerial conductor led in close proximity to one terminal of the secondary, an earth connection connected to the other terminal, a receiver, two fixed contacts, one connected to one terminal of the primary, and the other to the receiver, a pivoted arm and two contacts on the arm insulated from each other and opposite the fixed contacts, one being connected to the other terminal of the primary and the other to the aerial conductor."

DURING a thunderstorm recently the main lighthouse at Sandy Hook, which is one of the oldest on the coast, having been built by the British, was struck by lightning and its electrical mechanism rendered useless. The bolt entered the north window of the lantern tower, striking the electric transformer, burning out fuses and wires, and then ran along a wire lead-



ing to the ground. In its passage it set fire to some oil stored at the foot of the tower, but the blaze was extinguished by the keeper and his assistants. The lantern has since been lighted with oil which will be used until the electric apparatus can be replaced.

The opening of the Northwestern Elevated Railroad in Chicago, which will take place tomorrow, is to be marked by elaborate ceremonies, and invitations have been sent to a numbe of people to attend the opening, and to ride n the first train. According to Mr. Yerkes' estimate, the road will, when it is in full operation, carry an average of 65,000 passengers a day.

THE first test of electric power in Chico, Cal., was made a short time ago when the current from the Butte County Electric Power and Lighting Company's power-house at Centreville, fourteen miles distant, was turned on at the Sperry Flour Company's new mill at Chico. The test proved satisfactory.

According to a statement from Milwaukee, Wis., the plant of the Hatch Electric Smelting Company, a \$2,000,000 corporation, is about completed. A recent trial test upon lead ore proved most satisfactory. The results showed that the electric furnace would effect a saving of fully 50 per cent. in the cost of reduction as compared with the regular fuel burning furnaces.

On Wednesday evening, September 26, the residents of Springfield, Ill., will witness a grand electrical parade. P. J. Toomey will again have charge of it. This year the torches formerly used to show off the effect of the floats will be abandoned and the illumination will be by incandescent lamps. The parade will be seen on the principal street car lines of the city and will consist of sixteen floats, each of which will be illuminated by 300 divers colored lights, or a total of 4,800 lamps for the entire parade.

News from Spain states that as evidence of general progress in Valencia the business of the General Tramway Company of that city, embracing some twenty-five miles of rails, has been taken over by a French company, which is substituting electric power for the steam and horse traction hitherto employed. Electric cars are already running between Valencia and the port, a distance of three miles. The system employed is the overhead cable and trolley. The new undertakings in all lines of electrical work throughout the peninsula offer exceptional opportunities for the sale of apparatus, machinery and kindred lines.

NEARLY all of the jute mills in India are now lighted with electric lights. It was found that the working people could work overtime under much better conditions with increased pay in the electric-lighted mill; the consequence was that the workmen flocked to the well-lighted mills, so that those mills which opposed the introduction of electric light were forced to provide it.

An experimental section of electric track on the banks of the Miami and Erie canal in Ohio has been tested and found successful. Several Detroit capitalists are associated in the enterprise. The company will be known as the Miami & Erie Transportation Company.

# National Electric Light Association.

Excellent Attendance at the Twenty-third Convention.

LIEUT, J. B. CAHOON ELECTED PRESIDENT.

Important Papers Read and Discussed—The Standardization Scheme Endorsed - Reports of the Various Committees - Sketch and Portrait of the New President.

Most of the delegates from the East to the National Electric Light Association Convention in Chicago arrived in that city on Monday afternoon, May 21, in ample time to attend the reception held in the evening in the parlors of the Auditorium Hotel. Those from the West and South were less fortunate, many not arriving until Tuesday morning, and in some instances not until Tuesday noon.

As usual, there was delay in getting the members together for the opening session, and although the meeting was scheduled for 10 o'clock, it was fully an hour later before President Carnes could induce the members to take their seats. A summary of the proceedings follows:

TUESDAY MAY 22 - MORNING SESSION.

President S. T. Carnes called the meeting to order at 11 o'clock and delivered the following address:

## THE PRESIDENT'S ADDRESS.

Fellow members of the National Electric Light Association and gentlemen: In opening the session of the Twenty-third Convention, I congratulate you upon meeting again for the fourth time in the great city of Chicago, for aside from the natural advantages of these regular meetings for the discussion of the various practical questions that most deeply interest us and for the further advantage of absorbing the ideas and practices of the most advanced and scientific workers in this most wonderful branch of modern science, we have here in this great city these most advanced workings and up-to-date practices practicably illustrated in a manner most satisfactory to the inquiring mind of the average central station manager, who in the majority of cases perhaps holds his position not for his original knowledge of the science, but for his ability to utilize this knowledge so absorbed for the benefit of his stockholders whose investments are made solely with the view of returns.

I am sensible of the contrast between this session and your previous ones, and especially the 21st and 22d just preceding, when we were presided over by gentlemen of marked ability and scientific attainments and whose opinions carried all that weight and value to which their own eminent success entitled them, while your present presiding officer represents that class of smaller central station managers who while something of a veteran in the business management is yet a neophyte in the science.

I appreciate to the fullest the compliment of being placed at the head of this organization, notwithstanding I accepted it as one to my section of the country, the South, and not to myself individually, for I am fully cognizant of my inability to reflect any credit upon the organization which has already obtained such a

high standard. My case is not so exaggerated, perhaps, but reminds me of the story of the country boy whose father took him to the city for the first time. He explained to this boy that there was a great difference between the manners and customs of the metropolis and those in the rural districts, and while there he must see and hear all that passed; he must refrain from talking or engaging in conversation for fear it might be discovered that he was a green country fool. The boy fully impressed with this advice resolved to follow it implicitly. A good natured city gentleman observing the verdant hue of this somewhat remarkable looking young provincial was curious to know something of his origin and history and undertook to engage him in conversation. He applied a number of qestions, and while the boy looked rather intelligently at him, he made no answer, Then the man asked him "Are you deaf and dumb?" The boy shook his head but answered not a word. "Then you must be a fool," said the man. "There now, dad," cried the boy, "they have found me out already and I never opened my mouth."

Your indiscreet indulgence in this compliment at the expense of your better judgment constrains me to confess that I became sufficiently inoculated with that same unaccountable nerve to seriously entertain the idea of making an effort to deprive you of the advantages of meeting in Chicago, by calling this session in my own native city of Memphis with naught to recommend it but its natural Southern hospitality: warm as its summer sun, genuine as its native corn juice, and as refreshing as its world renowned mint, the combination of which has the happy tendency to produce an absolutely irresistible power factor in the establishment of fraternal affection and brotherly love. A more mature reflection, however, convinced me that I would have to deprive myself of the pleasure of showing you the liveliest city in the South by consulting your better interests and coming to Chicago as originally intended. In this I am sure we have lost nothing, for I find that the wide-awake, up-to-date, progressive, whole-souled, all-around good fellows of the electrical fraternity here have with their usual enterprise and accustomed hospitality made every provision for our entertainment and pleasure; and when the programme is announced I predict that the power factor of good fellowship will be so fully established with the same high efficiency which has always characterized this famous city, that we will be unanimous in offering the least possible resistance.

Believing that the papers which have been prepared by several gentlemen, in response to urgent request, will cover subjects of most interest to the greatest number present at this time, I refrain from offering any further recommendations than a careful consideration and a free discussion of them.

I now declare this Convention formally opened.

# PAPERS, REPORTS, ETC.

Letters of regret at being unable to attend the Convention from Elihu Thomson, Nikola Tesla, Prof. Edward L. Nichols and others were then read by the Secretary, after which Mr. Henry L. Doherty read a report on "Photometric Value of Arc Lamps." This was followed by a lengthy discussion in which Messrs. Bean, Scovil, Carnes, Wagner, White and others took part.

The President then announced that the final



business of the morning session was the report of the Committee of Grounded Circuits, but as the chairman of the Committee, Capt. William Brophy, was not present, the reading of the report was deferred. The meeting then adjourned.

#### AFTERNOON SESSION.

The President called the meeting to order at 2:45 o'clock and announced that the first paper for the afternoon session would be on "Exhaust Steam Heating," by Henry J. Frith of Watseka, Ill., and F. A. Copeland of La Crosse, Wis. This paper proved exceedingly interesting and was followed by an instructive discussion.

A paper was then read on "Central Station Economies," by Mr. W. L. Abbott of Chicago. In the discussion which followed Prof. Goldsborough among other things said: "There were one or two points which Mr. Abbott brought out that appeal to me very strongly, and I should like to take this opportunity to emphasize them. I presume a man engaged in educational work has an opportunity to study the attitude of young men towards their work probably quite as much if not more than men in commercial life; and I think the point which Mr. Abbott made in regard to encouraging young men by holding out to them some prospect of advancement is an important one. I believe you could almost double the efficiency of any young man in your employ by having him feel that he has an interest in the business, an interest which will give to him in years to come a better position. I think that is beyond dispute, and any man who ever tried that method of handling young men will bear me out in what I say. It is more and more emphasized in my mind every year, as I have greater and greater opportunity of observing the success of young men who graduate from universities. There is another quite important point to which Mr. Abbott called attention, the matter of adjusting the number of boilers in a station to the work which the boilers have to perform. I have frequently noticed one of the prime defects in station management has come from this fact of heating up water and boiler iron without getting any return for the coal so expended, and in some cases it has been demonstrated beyond a doubt that several thousand dollars could be saved each year by simply giving attention to this one matter of adjusting the boiler capacity to the load upon the station.'

Others who took part in the discussion were Messrs. Doherty, Jackson, Cahoon and Bement. Mr. Doherty moved that a committee be appointed to determine the best method of analyzing fuel gas. The motion was seconded and carried and the President said: I will appoint that committee later after consulting with some of these gentlemen. We will now have the report of the committee on "Standardization of Electrical Apparatus." Prof. Robb read the report as follows:

# STANDARDIZATION OF ELECTRICAL APPARATUS.

At the preceding Convention of the Association held in New York in May, 1899, Mr. Paul Spencer of Newark, N. Y., Chairman of the Committee on Standard Specifications for Electrical Apparatus, presented a report. This report approved of the work then being carried on by a Committee of the American Institute of Electrical Engineers in standardizing apparatus, and recommended that it should be the basis of any similar action on the part of this Association so far as technical matters are con-

cerned. Since that time a final report has been accepted and published by the Institute, the classification and the rating of the various kinds of electrical apparatus being defined in considerable detail. This report was very well received and has already been formally approved by most of our prominent manufacturing companies and engineers. Although only published a few months, its recommendations are now commonly recognized and followed. It is generally conceded, even by its critics, that the report is impartial as well as substantially correct, and that its general adoption will be a great benefit to the many interests affected by it.

Your committee believes that the approval of that report by the National Electric Light Association would be a powerful influence in securing its universal acceptance, and recommends that such action be taken.

The same committee of the Institute is now working, in co-operation with a committee of the American Society of Mechanical Engineers, to secure a standardization of the sizes, speeds, and armature bore of direct-connected engines and dynamos, thus avoiding the confusion which now exists regarding these matters. Considerable progress has already been made, and it is hoped that these committees will be able to secure the much desired uniformity. This is in line with the report already made and will probably commend itself to the Association as being worthy of approval.

Regarding the advisability of preparing standard specifications, a matter that has been discussed before the Association several times, there are differences of opinion, and it is well to have the technical questions settled before taking up the commercial ones, but it would appear that the former will be formulated and accepted in the near future, so that the time would be ripe for at least considering the latter. It is wise to go rather slowly in these directions, but it is satisfactory to know that steady advance is being made.

F. B. CROCKER, W. L. ROBB, CALVIN W. RICE.

Mr. Cahoon, Syracuse—Mr. President, I have gone over these specifications and standards made by the American Institute of Electrical Engineers, and it seems to me that they ought to have the approval of this Association. They have been adopted by the American Institute of Electrical Engineers, and I think we are perfectly safe in following in their footsteps. They are coming into general use by engineers in drawing up their specifications, and I know from my own experience they help to simplify matters; and I therefore move that we approve of this standardization and adopt it.

The motion was carried. The meeting then adjourned until Wednesday morning.

Wednesday—Morning Session.

President Carnes called the meeting to order at 10:30 o'clock.

The reading and discussion of the paper on "Uniform Accounting," by Lieut. James Blake Cahoon of Syracuse, N. Y., occupied the entire session. The discussion was exhaustive and participated in by Messrs. Doherty, Bean, Insull, Neal, Weeks, Smith, Davies, Scovil, Anthony and Walbank.

On motion of Mr. Scovil the following resolution was passed:

Resolved, That it is the sense of this Association that the President and Executive Committee of this Association shall appoint a committee to formulate a system of uni-

form accounting, and that this committee proceed with its work as promptly as possible so as to put the system of accounting to be recommended by the committee in printed form in the hands of the members of the Association so the report can be discussed intelligently at the next annual meeting of the Association.

The meeting then adjourned until 2:30 o'clock.

WEDNESDAY - AFTERNOON SESSION.

The President called the meeting to order at 2:30, and stated that Prof. Robb's paper would be taken up.

Prof. Robb—The title of the paper is somewhat different from that announced on the programme. It is "Series Enclosed Alternating Arc Light for Street Lighting Service." The paper was then read, and was followed by a lengthy discussion in which Messrs. Wait, Turner, Smith, Neal, Hine, Hillman and others participated.

The President then appointed Mr. Samuel Insull, Chicago: Chas. R. Huntley, Buffalo, and E. R. Weeks, Kansas City, as the Committee on Nominations.

The following resolution was adopted:

The National Electric Light Association, representing in the capacity of its membership three hundred million dollars invested in the development of electrical industries, in annual convention assembled, have

Resolved, That the National Electric Light Association, feeling the great interest in the establishment of a laboratory which would be able to impartially furnish authoritative standards, earnestly recommends the passage by Congress of the bill providing for the establishment of a National Standardization Bureau.

Mr. Henry L. Doherty, St. Paul, Minn., then read a paper on "Equitable, Uniform and Competitive Rates."

Messrs. Ferguson, Gilchrist and Anthony, discussed the paper.

The meeting then adjourned until Thursday morning.

THURSDAY — MORNING SESSION.

President Carnes called the meeting to order at 10:15 o'clock.

The first business presented to the Convention was the report of the Committee on the Standard Candle Power of Incandescent Lamps. The Secretary read the report, prepared by Dr. Louis Bell and Mr. James I. Ayer, which, among other things said:

"With respect to sources of standards, your committee desires to call earnest attention to a measure now pending before Congress for the establishment of a National Standardizing Bureau, corresponding in its functions to the German Reichanstalt, which would be able to furnish authoritative standards to all who should desire them, and your committee respectfully recommends that the National Electric Light Association as a body indorse the establishment of such a standardizing bureau, and communicate its indorsement to Hon. James H. Southard, chairman of the House Committee on Coinage, Weights and Measures.

"Such a source for standards of light will be much more satisfactory and authoritative than anything which could otherwise be obtained, and its value to our Association and to the art in general can hardly be overestimated.

"Pending the establishment of such a Government institution, your committee is arranging to have standard 16 candle power lamps of 110 and 220 volts prepared at Columbia University, New York City, in pursuance of your com-



mittee's specifications. We believe that these will at least furnish a uniform and available standard of excellent quality.

"These lamps will be furnished in pairs at the cost of preparation, to such members of the National Electric Light Association as may desire them, and orders may be placed with the Secretary of the Association for such standards, which will be put through as promptly as possible."

On motion the report was received and ordered to be printed in the minutes.

President Carnes—We will now have the report of the Committee on Grounded Circuits. Mr. E. H. Davis read the report of the committee, which concluded as follows:

"While your committee feel that the permanent 'grounding' of one side of the secondary circuit is not an absolute preventative of accidents to person and property, yet they firmly believe it is a step in the right direction, and if adopted will add greatly to the safety of the public, and reduce the hazards attending the transmission of electrical energy by what is known as the alternating or transformer system."

The report of the Committee on Freight Classification was next presented. It said:

"After numerous interviews and voluminous correspondence with the Central Traffic Association at New York we have succeeded in getting the same definite answers we got which were embodied in our report last year, namely, that the railroads did not see their way clear to harmonize the classification of electrical apparatus with that of other merchandise. They did not use these words, but they refused to take action, and the expression exactly covers the case.

"Your committee sees no possible hope for justice at the hands of the representatives of railroad companies by any application of ours. The Interstate Commerce Commission have expressed a willingness to listen to our statements, but have coupled with that expression the statement that they were powerless to do anything only to make a recommendation, that they had no power to act or to compel the railroads to take action.

"That a condition exists that is grossly unfair to the electrical interests is realized by every manufacturer.

"The only suggestion your committee has to offer is that the matter be taken up in the United States Courts, and they recommend the employment of suitable counsel to this end as being the only possible remedy to-day."

Mr. Bean, St. Joseph, Mich.—Mr. President, the suggestions in this report are very important, and I move that the recommendations contained in the report of the committee be referred to the incoming Executive Committee for action.

The motion was put and carried.

President Carnes—There is one more report to be presented—the report of the Committee on Standard Rules.

The report was read by the Secretary and was as follows:

"Your Committee on Standard Rules have continued the same line of policy during the past year as heretofore, viz., to discountenance any changes in the national code of rules not absolutely necessary; but with the march of improvement in the electrical field some changes therein and additions thereto have been found necessary since the issue of 1897.

"Many of the changes made were suggested by the chairman of your committee, and others

received his approval. The policy heretofore pursued by the insurance organizations of sweeping out of existence thousands of dollars worth of material that had been used previously with the sanction of insurance inspectors has been abandoned, and while new and better devices and material are substituted an opportunity is offered the manufacturer, dealer, contractor and station manager to sell and use the material and fixtures on their hands.

"The thickness of interior conduit, lined or unlined, has been established, and commercial gas pipe taken as the standard. 'Weatherproof' wire, so called, is tabooed for interior construction unless covered with a slow-burning material. A standard of thickness of insulation on wire, after a conference with the manufacturers, has been established. The much vexed question of the proper distance between fuse terminals has been determined, as well as the distance between fuse metals of opposite polarity. Switches are now being standardized as to the proper breaking distance between poles, etc.

"The rules have been changed so as to permit the running of two or more small motors in series multiple or multiple on constant potential circuits.

"Rubber insulation is not now insisted on for flexible cord pendants in dry places, but an elastic slow-burning material may be used.

"Rule 40 has been so amended as to permit in dry places the use of a slow-burning insulation similar to what has been known in the past as 'Underwriters.'

"In future, as in the past, the interests of the Association in the matter of changes in or additions to the rules for safe wiring will be diligently looked after."

President Carnes—We will now have the paper of Mr. Elmer A. Sperry, of Cleveland, on "Automobiles as a Source of Revenue to Central Stations."

Mr. George Francis Sever, of Columbia College, New York, who read the paper for Mr. Sperry, said: Mr. Sperry has not been able to come here to present this report and he has asked me to read it for him, this being the result of some tests and results of operation which he has found with the new storage battery he has invented as applied to automobiles.

On motion of Mr. Bean the report was received with the thanks of the meeting and spread upon the minutes.

President Carnes—If there is no discussion on this paper, Mr. R. S. Felcht, of Pittsburg, will read his paper on "Combination of Electric Lighting, Power and Railway Work."

Mr. Feicht presented the paper, and on motion of Mr. Bean it was received with thanks and spread upon the minutes of the meeting.

President Carnes—We have some rather important business to transact in executive session and will adjourn this meeting to go into executive session.

The meeting then adjourned to executive session.

THURSDAY-AFTERNOON SESSION.

President Carnes called the meeting to order at 2:30 o'clock.

Mr. Samuel Insull presented the report of the Committee on Legislative Policy, which brought forth considerable discussion.

The report of the Nominating Committee was then presented as follows:

For President-James Blake Cahoon, Syracuse, N. Y.

First Vice-President—Louis A. Ferguson, Chicago, Ill.

Second Vice-President—W. Worth Bean, St. Joseph, Mich.

Members of the Executive Committee, to serve until the close of the Twenty-sixth Convention—Charles B. Hunt, London, Ont.; Ernest H. Davis, Williamsport, Pa.; Henry L. Doherty, St. Paul, Minn.

On motion of Mr. Scovil, the Secretary was authorized to cast the ballot of the Association for the members nominated.

The Secretary cast the ballot and President Carnes pronounced the gentlemen duly elected.

President Carnes—I will ask Mr. Insull and Mr. Huntley to escort the newly-elected President to the chair (Mr. Cahoon escorted to the platform). Gentlemen: I have great pleasure in introducing to you your new president, Mr. J. B. Cahoon, whom I am sure will reflect great credit upon the Association during the ensuing year. (Applause.)

Mr. Cahoon-Gentlemen: I suppose when a newly-elected President takes the chair he is expected to make a speech. I only want to say one or two words with reference to the work which has come up in this Convention. I think this Convention has been one of the most promising, and one that is to be most fruitful in results of any Convention I have ever attended. The work outlined for the coming year is such that I do not believe the President of the Association is going to have quite as easy a time of it as he has had in the past. We have taken up the subjects of accounting and of meter rates, and these two matters it seems to me should be pressed forward to completion. The question of cost is an important one. In view of what Mr. Huntley said, which I think is borne out by many of the companies in other sections of the country, that is, that only 231 per cent. of the electric light companies in New York State are paying dividends, the question of the determination of the cost of our product certainly deserves more consideration than it has been given in the past. Another point that seems to be forging rapidly to the front is the question of municipal ownership. In December of this year the American League of Municipalities meets in Charleston, S. C., and in the meantime we have to formulate some plan whereby we can secure what we went after last year, namely, the co-operation of the League in the determination of costs of municipally operated plants. That seems to be in general an outline of the work that is to be taken up. I want to say a word in regard to the use of the offices of the Association in New York. Last year I suggested that when the smaller plants were making changes in their systems, as many of them are doing, that they send to the Secretary of the Association a plan of their changes. Many of the small plants cannot afford to employ electrical engineers to design their work for them, but they do need the assistance of the Association in such matters as these. I am in hopes that this suggestion will be taken to heart. Gentlemen, I thank you very much for the honor you have conferred upon me in electing me as your President. (Applause.)

Brief remarks in acknowledgment of their election were made by Messrs. Ferguson, Bean, Davis and Doherty.

The report of the Secretary and Treasurer was read, showing the following financial transactions during the year:



Balance on hand, including special

President Carnes—I wish in retiring from the presidency to express my high gratitude for the high compliment you paid me in my election, and especially for your patient indulgence with my shortcomings and lack of ability to serve you as our former Presidents have done. While I have done the best I could, I realize fully how little that has been, and I am very grateful to you for your kind indulgence. (Applause.)

The meeting then adjourned.

# JAMES BLAKE CAHOON.

Lieut. James Blake Cahoon, the newly-elected President of the National Electric Light Association, was graduated from the United

ager of the expert department. He retained this connection with the company for five years, and at the same time was also made successively engineer-in-charge at the Lynn (Mass.) works and of the railway, marine and special-production departments, effecting the reorganization of these departments and placing them on a working basis. Subsequently he became engineer for the local companies' committee, having engineering charge of the local lighting companies in which the General Electric Company (into which the Thomson-Houston Company had in the meantime been merged) held a controlling interest.

Lieut. Cahoon left the General Electric Company in May, 1895, to become general manager of the electric light, gas, water and street railway companies in Elmira, N. Y. These properties had recently come under the control of the Mutual Life Insurance Company, and



JAMES BLAKE CAHOON, President of the National Electric Light Association.

States Naval Academy at Annapolis in 1879. and is thus one of the considerable number of former navy officers who have achieved prominence in the electrical field. He served on the U.S. S. Vandalia on the North Atlantic station until 1881 and was afterward transferred to the U S. S. Brooklyn, on the South Atlantic station, where he served until 1884, taking part in the Transit-of-Venus expedition in Patagonia in 1882. He received further technical training in the United States Torpedo School, from which he graduated in 1885. He was one of five selected to take a post-graduate course at that school in electricity. During this time Lieut. Cahoon suffered such a serious injury to the sight of his right eye, while conducting searchlight experiments, that he was ultimately; in 1889, impelled to retire from the

In the latter part of the year last mentioned Lieut. Cahoon became connected with the Thomson-Houston Electric Company as manwere greatly in need of a thorough overhauling and reconstruction to bring them up to a proper paying basis. An onerous task was thus put upon Lieut. Cahoon's shoulders, and, although progress was necessarily slow, the work was finally accomplished in the face of many obstacles.

More recently Lieut. Cahoon has taken up engineering work while still retaining an interest in central station properties. He was selected to design and build a 4,000-horse-power plant at Syracuse. However, this plan was given up upon the purchase of the existing electric light company's property by the syndicate with which the subject of this sketch was connected. Mr. Cahoon is now located in Syracuse as a consulting engineer and is also vice-president of the Oneida Light and Power Company. In addition, he is taking up the management of lighting properties. He is a veteran of the Spanish-American war and is a member of the Military Order of Foreign Wars, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers.

UTILIZATION OF EXHAUST STEAM FOR HEATING.\*

#### BY HARRY J. FRITH, Watseka, Ill.

The net earning of an electric light or power plant is represented by the gross income less the operating expenses and fixed charges. In all cases it is desirable the greatest return or net earning be produced on the money invested in the enterprise. To accomplish this result, each expense item must be reduced to a minimum and all productive factors, men, machinery, and equipment, worked to the fullest capacity.

Unfortunately, the electric load runs up to a peak of short duration, and machinery of ample capacity must be provided to carry the peak load, requiring investment oftentimes out of proportion to the average load. Boilers, in particular, prove inefficient on account of the short duration of their operating period. Could the boiler load be continuous, the efficiency would be greatly increased, and any plan that will produce a more uniform boiler load is a step in the right direction.

While the hours of the station employes are usually a little long, the actual labor performed is light, and if a uniform load were available (say, nearly equal to the peak), it could be cared for without additional labor expense. This is impossible; then, as nearly as practicable, each man and each piece of apparatus should fulfill those conditions which (provided the returns are sufficient) increase the net earning, accomplishing a much desired result.

As ways and means to this end, I shall take up the production of current and resulting by-products. The primary operation is the production of steam by burning coal in the furnace, which gives steam, and waste in the form of flue gases, radiation of heat from the furnace, etc. Ashes are left as a by-product of more or less value, as in most places a ready market for them exists. Aside from this insignificent saving, there is in the steam generator no particular by-product that can be utilized, except in large plants, where the flue gases may be put through fuel economizers and part of the heat in them be saved.

The efficiency of a tubular boiler under test conditions is probably very nearly seventy-five per cent. However, under ordinary conditions, as found in the smaller class of plants, sixty five to seventy per cent. probably more nearly represents the results obtained. Clearly, there is little or no chance of bettering this part of our station unless means are found whereby the boilers may be kept under a more even load.

The next operation is the use by the engines of the steam generated in the boilers, whereby some eight or ten per cent. is utilized; that is, ten per cent. of the available heat is converted into work. This, I believe, is a maximum figure for plants using simple engines run noncondensing. The engines deliver some ten per cent, of the heat of the steam in the form of power, and waste the remaining ninety per cent, in the form of exhaust. Of this exhaust, which may be considered a by-product, something can be saved in heating feed water, so it is safe to say that fully eighty per cent of the heat delivered by the boiler is, while a valuable by-product, thrown away and wasted, and represents a large portion of the operating expenses. Not only is the heat thrown away, but nearly all of the water evaporated is also thrown

\*Paper read at the Twenty-third Convention of the National Electric Light Association, Chicago, Ill., May 22, 1900.



away. If this water were saved, it would not have to be replaced with fresh water, and much trouble with dirty boilers would be avoided.

The other losses in transmission and conversion into electrical energy are well known, and are small. The heat in the exhaust represents the largest loss of a by-product, and I shall consider means for saving it and converting it into a profit. Can this be saved and made to yield a profit? I believe it can by using the exhaust steam for heating purposes. However, we should have an ideal system. The saving and sale of this heat, and the saving of the water of condensation require careful consideration, and I shall try to take the matter up in its various phases.

The temperature of exhaust steam, without back pressure, is 212 degrees Fahrenheit, making it applicable only for heating buildings. To use this for heating purposes from an exhaust heating central station, it is necessary to have a proper distribution of the heat to the points of consumption; and in distributing heat from a central station to distant points, one is confronted by a problem of no mean proportions.

First—The heat must be conducted through pipes, which must be well insulated to prevent radiation and loss.

Second—The heat must be moved rapidly.

Third—The heat in the exhaust steam must be used without placing any back pressure against the engine, for back pressure is a serious detriment to the efficiency of a steam plant. The ordinary engine working under economical conditions with a steam pressure at the throttle of 85 shows a M.E.P. of thirty-five to forty pounds if there be no back pressure except that required to overcome friction of the exhaust steam in its passage through the exhaust parts to the atmosphere. Back pressure detracts from the load-carrying capacity of the engine. Even five pounds back pressure means one-seventh of the power of the engine thrown away. To be sure, this may be offset by increasing the boiler pressure by some ten pounds; but this is not an economical operation and in many cases it is impossible.

Fourth—The system for furnishing this heat must be able to supply any class of consumers.

A system in which the radiators are always at or above a certain fixed temperature, regardless of the demand, is similiar to burning lamps all day to have light for the night. It is very evident that in an ideal system the regulation of the degree of the heat circulated must be under absolute control, so that a suitable heat may be furnished on a mild spring or fall day as well as during a winter blizzard and all intermediate weather. In a steam system the radiating surface is always at least 212 degrees. A necessary feature in successful heating is lost, for either all of the heat or else none is available; and on mild days, with the heat all on, the windows must be opened to reduce the temperature, and with the heat all off it is too chilly for comfort. The heating period has very few blizzard days annually—perhaps a dozen-about thirty days of zero weather, and the rest is weather wherein the temperature ranges from seventy degrees down to zero. This puts the system at maximum capacity for a dozen days, medium capacity for about thirty days, and under a light load for the greater portion of the time; the last condition prevails for fully three-fourths of the season. Clearly, regulation and ability to furnish mild heat are very important features, and in an ideal system. the degree of heat must be under absolute control. In other words, there must be distributed just enough heat at the right time and place, and a system in which the degree of heat cannot be varied at will must of necessity be wasteful during the period of light load.

Fifth—It is necessary to convey this heat from the central station to the various points of consumption in an efficient manner. For the accomplishment of this it is essential that there be minimum losses of heat by radiation in the mains underground, which requires a rapid movement of the heating medium; this operation must also be accomplished with a minimum expenditure of power. The circulating device must be reliable and inexpensive to maintain, otherwise there will be a loss of power and consequently of efficiency.

The entire system must be reasonable in first cost, in maintenance, and in operating expense; must be simple and reliable. There must be no weak points in it. It must be compact and occupy little space; must be neat in appearance and durable. All complicated parts and automatic devices must be avoided, as these are notoriously liable to get out of order and give more or less trouble, requiring expert attention. The system must be so constructed and installed that the depreciation account will be kept down to a minimum.

There must be provision to heat the boiler feed water, or, better still, the exhaust steam should be condensed, filtered to remove any oil, and returned to the boiler at a high temperature.

(To be continued.)

# CONDITIONS OF ELECTROLYTIC CORROSION IN BROOKLYN.

# BY SAMUEL SHELDON.

The borough of Brooklyn spreads over 60 square miles, and is covered with a network of surface trolley tracks. During the rush hours about 1,100 cars run upon these tracks and are supplied with current from seven power stations, supplying in all 47,000 amperes. Four of these are situated upon the East River water front and supply over 80 per cent. of the full load current. The currents return to the power-houses by the following paths:

First by the rails of this system, which are all bonded together, different lines employing different bonds. There are, for example, the cast weld bond, showing a conductivity of 100 per cent. or more of continuous rail; the Johnson electric weld bond, showing 85 per cent.; the R. P. Brown interfoliated bond giving 94 per cent., and the protected rail bond giving varying conductivities according to size of bond and rail

The second path of return results from the peculiar geographical position of the borough, and the singular conditions of the traffic. All of the car lines lead to the borough of Manhattan. During the rush hour at 6 P. M., nearly half of the cars in operation at the time are receiving current within a radius of one mile of the Brooklyn end of the Brooklyn Bridge. At this time a large proportion of the currents are returned by way of the East River.

The third path at present takes but a small part of the current, and consists in return feeders connected with the tracks at various points.

The fourth path, which it is the intention of the engineers of the Brooklyn Rapid Transit Company to utilize extensively along certain

lines, has become available as a result of the combination of the elevated railroad interests and the trolley railroad interests. It is, namely, the whole elevated structure. This is also used at present as a return circuit for the currents used in the operation of the few third rail trains which are now upon the elevated lines.

The fifth return path consists of the mains and the service pipes of the municipal water department, the mains and service pipes of the Brooklyn Union Gas Company, the cables of the New York and New Jersey Telephone Company, and the underground tubes of the Edison Electric Illuminating Company. These returning currents set up differences of potential between all underground conducting objects. The difference in potential between any two given points varies throughout the day, because of variations of the traffic conditions. In a similar manner it varies with the seasons. and is quite different on Sundays from what it is on week days. Furthermore, the potential differences are gradually growing smaller in the average, because of the better conductivity of the Transit Company's return circuit. They are also varying because of changes in the distribution of load among the power-houses.

The difference of potential between the rails and the hydrants and the rails and the gas mains varies from a fraction of a volt to 25 volts. Between the two ends of the Brooklyn Bridge there has been a difference of potential of 20 volts. Each power-house is surrounded by equipotential curves, and in the immediate vicinity of each the fall of potential is quite rapid.

The city may be divided up into districts, each power-house drawing current from a district. The boundaries of these districts hold the same position towards the returning currents of electricity as mountains do towards the water of a watershed. The difference of potential between a point on the boundary of a district and the ground in the immediate vicinity of the power-house supplying that district has been found to reach as high a value as 40 volts.

The municipal water mains pass through nearly all streets of the city and vary in size from 48 inches in diameter down. They are all made of cast-iron. Some are known as Scotch cast-iron pipes. These were made in Scotland and are of a peculiarly hard and tough cast-iron, which exhibits a very white surface on fracture, indicating a combination of the contained carbon. These pipes can always be recognized by ribs which occur at every two feet along the surface, and which are about four inches wide. These ribs consist of a thickening of the metal intended to furnish a firmer seating and more perfect joint for taps and branches.

Other mains that are of American manufacture are very much softer than the Scotch iron, but also exhibit a white surface on fracture. The employes of the water department prefer to work upon these mains because of the much less labor required to operate the cutting tools, owing to the relatively greater softness. In no case has an electrolytic corrosion of the water mains been discovered in the city, although many cases of corrosion of the service pipes have occurred.

The Brooklyn Union Gas Company has 7554 miles of gas mains. These are all made of white cast-iron. From them are led wrought iron service mains which are supplied with malleable iron and in some cases brass fittings. There are 272 miles of wrought iron service

<sup>\*</sup> Paper read at the 17th General Meeting of the American Institute of Electrical Engineers, Philadelphia, May 16, 1900.

pipes. These with their fittings have suffered corrosion in very many cases. Thirty-eight service pipes on one block were completely destroyed in three years. However, not until within a year has any corrosion of the mains been discovered, and then in but two cases. In each case the main was in an excessively dangerous district.

The gas company claims that there has been an abnormal increase of leakage since the introduction of electric traction in 1894. The leakages for various years are not accessible, but during 1899 it amounted to 13 per cent. of the total production of 4,500,000,000 cubic feet.

The New York and New Jersey Telephone Company has many miles of underground cables, the lead coverings of which have been pitted and perforated in many cases by electrolysis. The company, however, is fully aware of the possibilities of electrolytic corrosion, keeps itself informed of its cables and concerning the stray currents in their sheathings.

The Edison Illuminating Company has over 100 miles of underground tubing. These tubes have suffered considerably from electrolytic corrosion, doubtless resulting in many cases in the short-circuiting of the enclosed conductors.

Considering the magnitude of the system of the Brooklyn Rapid Transit Company and the time that it has been in operation (the first electric car was operated in 1894), considering the poorness of the ground return which existed on parts of the system up to within three or four years, it is surprising that no evidences of the corrosion of cast-iron have been discovered with the exception of the two cases mentioned above.

The apparent immunity of cast-iron was noticed by the Board of Commissioners of Electric Subways of the City of Brooklyn, and attention was called to the fact in several of their reports. These reports indicate that in their opinion the immunity was due to the peculiar chemical constitutions of the special kinds of cast-iron of which the mains were constructed. It hardly seems credible that such a form of iron could exist.

To experimentally test the matter, samples of Scotch and American pipes have been obtained from the water department as well as samples of the gas mains from the gas company. These have been used as anodes in various electrolytic cells. The electrolytes consisted of samples of earth from various parts of the city, moistened in some cases with distilled water, and in other cases by hydrant water or salt water. These cells were subjected to voltages of various magnitudes. In every case the anode was corroded, showing conclusively that there is no immunity because of chemical con-

In preparing some experiments to determine whether or not the apparent immunity of castiron mains was due to an electrolytic polarization E.M.F., due to absorbed gases in the pores of the rough exterior of the pipes and of sufficient magnitude to prevent the sending of any considerable current by the stray voltages, the true cause of immunity was discovered. In the casting of pipes in sand molds, the hot iron unites with a layer of the sand to form a silicious compound probably silicate of iron which forms a thin coating over the surface of the completed pipe. This coating is extremely thin, and is a non-conductor of electricity. It is not continuous, but contains perforations in many places. If a piece of pipe be covered with insulating paint, exposing only the rough sandpocked exterior surface, and if it be made an anode in an electrolytic solution, much less current will flow through the solution under a given impressed E.M.F. than under similar conditions with an anode exposing a filed surface of equal area. In some cases, no current at all will pass until the impressed voltage rises to a certain minimum value. If, however, a current be made to pass for a few moments under a moderately high impressed E.M.F., the rough sand-pocked surface becomes conducting throughout. The protecting film or skin seems to act like the non-conducting film thrown down in an aluminum cell. The existence of a perforated skin can also be shown by endeavoring to close a circuit, which contains a current indicating device, by means of a wire on the sand-pocked surface. The end of the wire may be rubbed around in many places before there is any indication of a closed circuit. Then, again, a spot will be found where the circuit is closed, and there is no indication of resistance of any magnitude at the point of contact

There is another thing which is perhaps equally as influential in preventing electrolytic corrosion, and that is the resistance offered by the soil. The various interested companies have observers in the field recording the potential differences between the rails and their underground system. Whenever the system is positive to the rail, the district is considered as dangerous, and corrosion is expected. It is well to notice that as corrosion will result at one side of any discontinuity of a metallic circuit, it may be expected to occur even in districts which are not considered dangerous. On the other hand, the amount of corrosion which will take place in a dangerous district under a given potential difference is dependent upon the smallness of the resistance offered by the soil. Now the measurement of the resistance of soil under laboratory conditions gives information which can hardly be applied with propriety to street conditions. It is much to be preferred that the resistance between the tracks and the other systems should be measured directly. While it is impossible to determine the resistance in such a manner as would enable one to calculate the current density at any point, and to ascertain the direction of flow lines, yet some idea of the magnitude of the ground resistance can be determined by the following method, which makes use of a low reading voltmeter (0 to 3 volts), and a battery having an E.M.F. of E volts. Let the resistance of the voltmeter be R ohms, then at any reading of the voltmeter  $\theta$ , the current which is traversing that voltmeter is  $\theta \div R$  amperes. Now to measure the resistance between two points, for example, a point on a rail and a point on a hydrant, take the following three readings: E', with the voltmeter alone connected between the two points; E with the battery alone connected to the voltmeter, and 0 with the battery and voltmeter connected in series between the two points. The effective resistance X between the two points is determined by considering that

whence 
$$\frac{E + E'}{B + X} = \frac{\theta}{R}$$

$$X = \frac{(E + E') R}{\theta} - R$$

$$= R \left( \frac{E + E'}{\theta} - 1 \right).$$

For ground voltages, which are less than one volt, two cells of ordinary dry battery are sufficient. The assumption in made that the small current sent by the battery in making the measurement does not produce an E.M F. of polarization of appreciable magnitude. This is unquestionably warranted when we consider the exposed area of the pipe or rail, and the smallness of the current. Measurements of effective resistance taken at a great many points between the hydrants of the water system and the rails in Brooklyn give values lying in the majority of cases between 10 and 35 ohms. The character of pavements seems to have no great influence on the resistance of the soil underneath. Measurements have been made in the case of asphalt, cobble stone, Belgian block, granite block, vitrified brick and dirt roads. In all cases there were variations in resistance with different conditions under the same pavements, but the average resistance was nearly the same in all cases.

It is very probable that the current which would flow through the resistance indicated by these measurements under a given difference of potential would be distributed over a large area of pipe surface, and therefore the current density under voltages of the magnitude of those which exist in Brooklyn, would require a long time to result in destructive corrosion.

These investigations have been carried out in collaboration with Mr. Charles V. Rapelje.

## THE USE OF ALUMINUM LINE WIRE AND SOME CONSTANTS FOR TRANS-**MISSION LINES.**\*

#### BY F. A. C. PERRINE AND F. G. BAUM.

Until the present time, discussions of the use of aluminum wire in line construction have been devoted to a consideration of the relative prices of copper and aluminum wires, the conductivity, tensile strength and other proportions of the aluminum wire being only considered as determining its relative price. During the past year the manufacturers of aluminum have demonstrated their ability to sell this wire at a price well below twice the price of copper per pound, and in consequence the new material has forced itself upon our notice and has demanded that we consider carefully all of its properties independent of any consideration of price. Having recently been forced into the purchase of a considerable amount of this wire by reason of the high price of copper and the low price of aluminum, the writers have made a careful study of the wire supplied, and now present the results obtained in hope that they may be of service to other engineers.

Some of these results have already been published,† but in these publications there have been so many misprints that it seems advisable to present the whole matter anew. The line for which this wire was purchased is about forty-three miles in length, and the country through which it runs varies in elevation from about one hundred feet above the sea level to at least two thousand feet; one-half lying in nearly a straight line through a country almost level, while the remainder is over the mountains, through which the line runs almost straight, surmounting high hills and descending into deep gulches. In some cases the length of the poles was proportioned to decrease the vertical line deflection, but as an

<sup>\*</sup>Abstract of paper read at the 17th General Meeting of the American Institute of Electrical Engineers, Philadelphia, May 16th, 1900.
†Tests and Calculations on a Forty Mile Aluminum Transmission Line. F. A. C. Perrine, Pacific Coast Transmission Association.

accurate preliminary survey was not available, much less grading of poles was possible than would have been desirable. This defect in pole setting was largely counteracted in the wire stringing by drawing of a number of spans at one time, so that at depressions and elevations there was a very little up or down strain put on the wire when it was tied to the insulators. The standard pole used was of square sawn redwood, thirty feet in length, seven inches square at the top, and tapering to twelve inches square at the butt or about 11 inches at the ground line five feet above the butt. Each pole was gained for three cross-arms 201 inches on centers, the gains being cut # inch deep, into which the cross-arms were bolted by single # inch through bolts. The arms themselves were 4x4 inch Oregon pine bored for two pins each, the top and bottom arms being three feet in length and the center arm four feet. The wires on this system of construction are arranged in a hexagon, each side being 24 inches

This system of construction presents some advantages for three phase working at high voltages for long lines, especially where the two sets of circuit are to be operated from the same bus bars. If both of the wires on each arm are at the same potential, the arrangement of each circuit is that of an equilateral triangle, each side being 41 inches, while the minimum distance for leakage between any two wires of different phases is 36 inches of cross-arm and 20 inches of pole, while the length of the longest arm necessary is much less than that in any other system of construction: the pole head is symmetrically loaded, and for these reasons the pole construction is exceptionally stable under all stresses.

The insulators used were a flat topped glass. triple petticoat type, about five inches in height and seven inches in diameter, with a wire groove of about .35 inches radius. The insulators are supported by eucalyptus pins of a length to give a distance of four inches between the bottom of the insulator petticoat and the cross-arm, eucalyptus wood having been used on account both of its availability in California for a special pin, and on account of its great strength, which is of extreme importance in the construction of pins of such length.\* For further insulation and preservation, the cross-arms used were creosoted by a treatment in which the timber was at first dried carefully and then injected with ten pounds of dead oil of coal tar to the cubic foot, an operation requiring approximately thirteen hours for its completion, while the pins were boiled at a temperature of about 225° F. for about eight hours in a compound of coal tar and asphaltum, a treatment which gave a better external surface than the creosote. This latter coating did not penetrate the wood materially, but after experimenting extensively with this wood at temperatures up to 225° F. and pressures up to 160 pounds per square inch without effecting any appreciable penetration of this wood, either with creosote or other extremely fluid materials, all idea of the use of a penetrating compound was abandoned. and an endeavor made to obtain a coating which would provide the most complete external protection.

On this line as erected, the arms were braced by a bent angle iron brace, but this precaution seems now to be entirely unnecessary, and a subsequent line, belonging to the Yuba Power Company, erected on much the same plan, is not braced at all. For arms of over five feet in length a brace is certainly advantageous, though it is the opinion of the writers that for high potential service the braces should be of wood mortised into the cross-arms and nailed to the pole face.

The above complete physical details of the construction are unnecessary for the discussion of aluminum line wire, though it is believed that its stability when erected depends upon a careful study of all such conditions.

The line as erected carried only four wires arranged on the top and bottom cross-arms, thus taking their location at the corners of a rectangle 24" on the short side and 41" on the long side. This arrangement was adopted for the purpose of making temporary use of some two-phase machinery which was in place and underloaded, allowing certain new customers to be taken on quite a year in advance of the contemplated completion of a three-phase plant for which the pole line was really designed.

It was at first feared that this arrangement of the wires would result in inductive disturbances between the phases, as the wires took their positions in the diagonally opposite corners of a rectangle, in place of the corners of a square, as is necessary for complete absence of mutual induction, but the anticipated trouble was not found. Careful measurements were made with one phase short circuited, and the other carrying about 20 amperes with a periodicity of 60 cycles per second, both with a Weston 75 volt voltmeter and a Rowland electrodynamometer, with the result that no deflection was observable on the voltmeter, while the current read on the electro-dynamometer amounted to only about .001 ampere, the resistance of the dynamometer being 25 ohms and of the line 90 ohms. Only one additional question of installation needs attention, which is the presence on the tops of the poles of a barbed wire stapled to the wood of the pole and grounded at every fourth pole by a galvanized iron wire leading down along the pole and soldered to an iron plate 18 inches square and inch thick, set in the pole hole immediately under the foot of the pole itself. This wire was intended as a lightning guard, and it has apparently done very effective service in discharging the line in all weather.

The wire used was intended to be equal to No. 3 B and S copper wire in its electrical resistance, and the manufacturers were required to furnish this conductivity in a wire not weighing more than 420 pounds per mile. All the wire supplied was carefully inspected by Mr. A. E. Kennelly, and his reports give the following averages for the total quantity:

Diameter	293.9 mils
Wt. per mile	419.4 lbs.
Resistance per mil foot	17.5 ohms at 25° C.
Resistance per mile at 25° C	1.00773 ohms
Conductivity compared with copper	59.9% by dimension
Tensile strength of wire	
No. of twists in 6 inches for fracture	17.9
Tensile strength per square inch	82898

Comparing this with copper it is seen that this wire is approximately the same as copper in the following sizes:

Size of aluminum wire = No. 1 B&S copper. " = No. 3 " " = No. 5 " " = No. 6 " Resistance of Tensile strength "
Weight of " Weight of

Therefore, on the basis of the same conductivity the aluminum compares with copper as follows:

The mechanical properties of this wire present some well marked characteristics. In the first place, the number of twists necessary for fracture varies considerably, although the ductility test of wrapping six times around its own diameter, unwrapping and wrapping again is well sustained. This irregularity in the twisting test is generally a mark of impurity in wire, but we know so little as yet of the exact characteristics of aluminum in particular, and the twisting test is in general so unreliable that it is unsafe to base any exact statement on this one test, particularly as the same after erection proved reliable. In carefully performing the test for tensile strength no exact point could be assigned for the elastic limit, as the metal seemed to take a permanent set almost from the first, but at a stress of from 14,500 pounds to 17,000 pounds per square inch, there is a marked increase in the permanent set which indicates that the safe working load lies somewhere in this region. In this the characteristics, of the aluminum do not differ materially from those of copper or other similar metals, and while this is a disadvantage it is not a singularity.

The fact that the wire will permanently elongate if seriously strained makes it necessary to use the utmost care in the erection of lines. and also the known high coefficient of expansion with temperature changes taken in conjunction with this property renders care in line stringing especially important and difficult.

Instructions to line foreman in stringing wires:

- 1. All spans are to be strung with deflections and tensions as specified.
- 2. Up and down hill spans to be sprung to correspond with level spans. In case level spans cannot be used, then employ dynamometer. and ease all wires over cross-arms.
- 3. All ties are to be made at one time by signal.
- 4. All ties are to be made crossing wires around insulator serving three times around wire, and twisting behind insulators; the ends of the tie-wires are not to be cut but bent back toward insulators.
- 5. Tie all wires on the outside of the insulators, except at corners where all are to be tied so that the strain is against the insulator.
- 6. Joints are to be made by means of sleeves twisted two and a half times, the ends of the wires being given one turn by hand around the wire. No tools being used, except in twisting the sleeves, and cutting off the ends of the wires. Before inserting the wire in the sleeve, the ends of the wire must be roughened by draw filing.
- 7. Barb wire is to be laid along the roof of the pole and held by three staples driven in tightly, but without kinking the wire. Ground wires are to be soldered to the barb wire, and at the bottom of the pole to the wire leading from the ground plate. All soldering acids must be carefully washed away after the soldering is done.
- 8. Beginning between poles one and two, all wires are to be barreled by shifting one pin, and same to be repeated between poles 21 and 22 and 41 and 42, and so on. Barreling always in the same direction of twist every twenty poles. A record must be kept of the location of every wire and every pole.

GENERAL CAUTION.

The greatest care must at all times be taken against kinking or scarring the wire; wherever the wire is accidentally kinked or scarred it must be cut and spliced.

<sup>\*\*</sup>Tests of a considerable number of pins made of eucalyptus, oak and locust show that the eucalyptus has about 20 per cent more strength than locust and 30 per cent more than oak.

The targets consisted of light sheet iron strips about two feet long and two inches wide, with an aluminum hoop bent into an eve at the top, by means of which they could be hung from the line wire. These targets were painted in three or four colors, with bands one inch wide. In use the captain of the linemen would hang his target on the wire to which a man on the next pole had also hung a target; then, as the wire was being pulled into place, he would sight from a band on his target to the same band on the adjacent target, and when the wire came into line with these two bands the signal would be given for all the linemen to tie at once. As a result of this method of stringing, an exceedingly uniform line, and one strong in accordance with the temperature was obtained.

One of the most serious problems in connection with the use of aluminum is in the choice of a proper joint. This metal is so highly electro-positive that it is unsafe to expose it to the elements in contact with any other material, as electrolytic corrosion is almost sure to follow such construction. Many of the failures which have been reported of this metal have been due to a neglect of this fact, as notably in the case of the plates on the yacht Defender, where the plates have been corroded at the contact with the bronze rivets used in fastening them to the frame. Whenever this metal is soldered or used in contact with any other metal, the joint should be thoroughly waterproofed to prevent such action. After discussing many joints, it was finally determined to abandon any attempt to solder or clamp the wire in any manner, and the joints were made by slipping the ends of the wire into an oval aluminum tube about nine inches long, which was then twisted with a pair of clamps similar to those employed in twisting the McIntire connector. After twisting the tube a turn was taken by hand of the loose ends, and the wire cut off close. The joint produced proved practically equal to the original wire in both tensile strength and electrical conductivity.

This wire was erected during the winter of 1898-99, which was an unusually open winter over the whole State of California, allowing practically continuous construction work, though the temperature varied all the way from about 30°F. to 80° F. at times when the wire was being strung. After it was finally erected it remained about three months on the poles before the machinery was delivered and put in place. During the first month of that time three breaks occured which were all apparently due to flaws in the material, but after these breaks were repaired the line wire gave absolutely no trouble whatever, though various accidents occurred to other parts of the construction. Many insulators were shot at and broken, bale wire and bale rope were thrown over the line, a twig short-circuited one phase and fell down burned, a large bird was killed by contact with the wires, and finally several porcelain insulators with porcelain pins were broken off and hung suspended by the wire. In January and February of the present year this whole line was taken down to give place to a much heavier one of the same material, an opportunity for an entire change having been found after the total destruction of the power house by fire last November.

During the past two years other lines of aluminum wire have been erected on the Pacific coast, all but one of which have given a considerable amount of trouble from causes that are not entirely apparent.

One line in Nevada County, erected at about the same time as that we have been describing, and for which the wire was of practically the same lot, has given no trouble whatever.

The power transmission lines of aluminum wire about Seattle have broken a few times, but have not given serious trouble. The breaks in this line, so far as the writers have been informed, seem to have been due to not allowing enough sag at the higher temperatures, and a consequent overstraining of the wire in cold weather

The most serious difficulties have been encountered by the telephone company in Washington and Oregon, and by the Yuba Power Company. In all of these cases it seemed almost impossible to keep the wires on the poles in certain sections, and in these portions the lines have been finally taken down and replaced by other wire of either copper or aluminum. The writers have examined many breaks from these lines, and would judge, from the appearance of the fracture, that the cause, whatever it may be, was similar. In those breaks there are many small flaws, but by far the greatest majority are clear, sharp fractures, with but a slight reduction of area, and that entirely on one side, a break very characteristic of improperly mixed and brittle alloys. Partially from the appearance of the fracture, and partially from the facts that the breaks occur only in certain sections of the line, the writers are of the opinion that this trouble is due to the presence of impurities in the material. This view is strengthened by the fact when measurements were made on the line of the Yuba Power Company, the resistance of the whole line was found to be 10 per cent. greater than it should have been if it were made of the quality of material described in the earlier part of this paper. Furthermore, in one-half of this line there were no breaks at all due to defects in the wire itself.

As a general conclusion, it is the opinion of the writers that aluminum can be safely used in place of copper where the proper precautions are taken in inspecting the wire before it is erected, and in erecting it with due consideration of its peculiar properties of low and indefinite elastic limit, high coefficient of temperature expansion and active electrolytic power.

Indicating our faith in this opinion, it may be noted that for the new line soon to be erected an aluminum strand ‡ inches in diameter has been ordered. This strand will be spliced with aluminum sleeves, and in the whole construction about one million pounds of aluminum will be employed.

# Proposals Invited.

The Treasury Department is inviting sealed proposals until June 12 for installing a system of electric light wiring in the United States Custom House at St. Louis, Mo. Plans and specifications may be obtained upon application to the Secretary of the Treasury, Washington, D. C.

# Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended May 26:

Amsterdam, 1 case \$15; Antwerp, 27 cases, \$4,384; Australia, 10 cases electric motors, \$823; Bologna, 5 packages, \$125; Bradford, 10 packages, \$1,188; Bristol 3 packages; \$350; British

East Indies, 1 case, \$41; British West Indies, 13 packages, \$404; Brussels, 59 packages, \$2,647; Central America, 1 case, \$10; Chili, 65 packages \$2,731; Cuba, 17 boxes, \$630; Darlington, 1 case, \$165; Garran, 6 cases, \$300; Genoa, 18 packages, \$6,505; Glasgow, 21 cases, \$1,012; Hamburg, 81 packages, \$10 204; Lisbon, 652 packages, \$8,703; Liverpool, 15 cases, \$638; London, 34 cases, \$1,-578; 240 packages, \$26,622; Madrid, 2 cases, \$74; Manchester, 6 cases, \$3,415; Mexico, 78 packages, \$2,886; Naples, 62 packages, \$17,118; New Zealand, 10 cases, \$159; Odessa, 7 packages, \$607; Peru, 511 packages, \$32,254; Porto Rico, 36 packages \$360; Riga, 6 cases, \$1,500; San Do mingo, 399 packages, \$4,187; Southampton, 20 cases, \$657, Stockholm, 1 case, \$110; U. S. Colombia, 6 cases, \$200; Venezuela, 13 packages, \$157.

#### LEGAL NOTES.

A case in equity recently came before Judge Lowell in the United States District Court of Boston, Mass., raising an issue in regard to patent rights on electrical machines which may prove of great moment. The suit is brought as a test case by the General Electric Company against the Webster & Dudley Street Railway Company, asking for an injuction preventing the latter named corporation from using dynamos as at present constructed, on the ground that the winding of the armature is in violation of a patent held by the General Electric Com-The patent in question is what is pany. known as the Eickemeyer patent. It is claimed the Eickemeyer patent covers the winding of a number of armatures now in general use in that the present winding was not used previous to the invention just mentioned. The Webster & Dudley Company contend that the winding used by them is that in general use on armaand that it was in use some time before the Eickemeyer patent was obtained.

# PERSONAL MENTION.

Mr. George B. Griffin, formerly general manager of the Elmira (N. Y.) Illuminating Company, is now agent for the Manhattan General Improvement Company, an electrical concern of Newark, N. J., and has his headquarters in Boston, Mass., having charge of the company's business in the New England States.

Mr. C. L. Harry, recently accepted the superintendency of the street railway and electric lighting systems at Jackson, Miss.

Lieut. John B. Blish, the Navy's principal electrical expert, who is now at Newport, R. I., establishing an experimental wireless telegraph station, has been ordered to proceed to Europe on the Lucania next Saturday to study submarine cable laying, with a view to utilizing his experience in the construction of a Government line to Hawaii, and eventually to Manila.

# INCORPORATIONS.

The B. & H. Electric Construction & Supply Company, Kittery, Me.—to deal in electrical and plumbing supplies. Capital stock. \$30,000. Incorporators: L. M. Cook, L. H. Murphy, J. Murphy. A. Brownell, all of Providence; F. E. Rowell, attorney, of Kittery.

The Carleton Electric Company, New York City—to do an engineering business. Capital stock. \$100,000. Incorporators: H. C. Carleton, C. E. Phelps. both of New York City; J. C. Osgood, of Denver, Col.; Harmon & Mathewson, attorneys, New York City.

# ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHRL, Bolicitor and Attorney for AMERICAN AND FORKIGN PATENTS, at 302 and 504 Broadway (Room 1204), New York City, also at 659 F street. N W., Washington. D C., who has been identified with this work before the U S Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks. Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL. Nos. 302-304 Broadway, New York City. N. Y., or 659 F street, N. W., Washington, D. C. Côpies of any patent published can be furnished upon pay-



nt of ten cents. When ordering give name, date and title of invention wanted.

## LETTERS PATENT ISSUED MAY 22, 1900.

#### ELECTRIC RAILWAYS AND APPLIANCES.

649,989. System of Electrical Distribution for Electric Railways, Fedor R. Koss, Charlottenburg, Germany. Filed March 8, 1900

March 8, 1900.

649,990. Underground Electric-Railway System. John B. Larkin, Pittsburg, Pa. Filed Sept. 9, 1899.

650,030. Apparatus for Operating Contacts for Electric Traction. Arthur Ballance and Samuel A. Jefferson, Hull, England. Filed Nov. 10, 1899.

650,094. Track and Conduit Construction for Underground Electric Street-Railways. John H. Robertson, New York City, assignor of two thirds to Albert J. Elias. same place, and Louis Duncan, Baltimore, Md. Filed Aug 18, 1899.

650,123. Contact Device for Electric Railways. William M. Brown, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Sept. 20, 1899.

# ELECTRIC LIGHTS AND APPLIANCES.

649,922. Appearatus for Electrically Lighting Lamps. Henry C. Farquharson. New York City. Filed Sept. 5, 1899. 649,976. Electric Incandescent Lamp. Jacob Atherton, London, Ingland. Filed July 24, 1899. 649,178. Manufacture of Filaments for Incandescent Electric Lights. Samuel B. Husselman, Worcester, Mass. Filed Feb. 16, 1900.

#### ELECTRICAL MACHINERY AND APPARATUS.

ELECTRICAL MACHINERY AND APPARATUS.

649,942. Synchronizer for Electric Machines Carl J. A. Michalke. Charlottenburg, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed Dec. 31, 1897.

649,972. Electric-Motor-Controlling Device. Thomas S. Watson, Milwaukee. Wis., assignor to the Browning Manufacturing Company, same place. Filed Oct. 4, 1899.

649,974. Dynamo-Engine. Murcy L. Whittield, Memphis, Tenn, assignor to the Whitfield Company, same place. Filed April 15, 1899.

650,010. Electric Switch. Jesse B. Heller, Philadelphia, Pa., assignor to the Lorain Steel Company of Pennsylvania, Filed Sept. 23, 1899.

650,067. Controller for Electric Circuits. Abraham L. Waters, San Francisco, Cal. Filed Aug. 2, 1899.

650,168. Electrical Switch. Edward J. Wade, London, Eng. Filed March 8, 1900.

650,141. Static-Induction Generator. Rome V. Wagner, Chicago, Ill. Filed Nov 29, 1899.

650,196. Switch for Electric Motors. Gustav A. Schoeller, Mulheim-on-the-Ruhr, Germany, assignor to Fried. Krupp. Essen, Germany. Filed Feb. 1, 1900.

650,244. Armature for Dynamo-Electric Machines. Gustavos Heidel, St Louis, Mo. Filed Sept. 18, 1889.

#### TELEPHONES AND TELEPHONE APPARATUS.

649,859. Signal for Trunk-Lines of Telephone Systems. Charles E. Scribner, Chicago, Ill, assignor to the Western Electric Company, same place. Filed June 17, 1898.

# MISCELLANEOUS.

MISCELLANEOUS.

649,917. Electric-Shampoo Apparatus. Henry C. Doersch and David W. Cranston, Nyack, N.Y. Filed Oct. 11, 1899.

649,933. Electric Releasing Device for Shutters. James Hueston, New York City. Filed Aug. 19, 1899.

649,930. Battery-Plate. James K. Pumpelly. Chicago, Ill., assignor to Sanuel W. Ehrich, New York City. Filed July 19, 1898. Renewed Oct. 27, 1899.

649,994. Automatic Circuit-Cosing Telegraph-Key. Louis F. Ritchie, Elwyn, Pa. Filed Oct. 12, 1897. Renewed Oct. 20, 1899.

649,998. Element for Storage Batteries. Elmer A. Sperry, Cleyeland, O., Filed Sept. 30, 1899.

F. Ritchie, Elwyn, Pa. Filed Oct. 12, 1897. Renewed Oct. 20, 1899.
649,998. Element for Storage Batteries. Elmer A. Sperry, Cleveland. O. Filed Sept. 30, 1899.
650.014. Electric Motocycle. Isidor Kitsee, Philadelphia, Pa. Filed July 3, 1899.
650.015. Electric Welling. Eugene Lagrange. and Paul Hoho, Brussels, Belgium. Filed Aug. 15, 1892.
650,051. Electroplating Apparatus. Louis Potthoff, New York City. Filed Aug. 2, 1899.
650,062. Thermo-Electric Pile. Lucian Gottscho, Charlottenburg, Germany. Filed Dec. 19, 1809.
650,090. Electrical Ear-Trumpet. Frances McDaniel, New York City. Filed Dec. 1, 1899.
650,096. Recorder for Rapid Automatic Telegraphy. Carl F. Rodde. Berlin, Germany, assignor to Siemens & Halske Aktlen-Gesellschaft, same place. Filed Feb. 3, 1900. r. Rodde. Berlin, Germany, assignor to Siemens & Halske Aktien-Gesellschaft, same place. Filed Feb. 3, 1990.
650, 109-650, 110. Apparatus Employed in Wireless Telegraphy Guglielmo Marconi, London, Eng., assignor to the Wireless Telegraph & Signal Company, Limited, same place. Filed Oct. 12, 1869. Dec. 28, 1819.
650, 113. Insulating-Coupling. Louis McCarthy, Boston, Mass. Filed March 9, 1899.
650, 115. Insulating-Coupling for Electric-Wire Conduits. Gardner W. Proutty, Littleton, Mass., assignor to the W. T. C. Macallen Company, Boston, Mass., Filed April 27, 1899.
650, 124. Electric Metal-Working Apparatus. Clyde Coleman, Chicago, Ill., assignor, by direct and mesne assignments, to the Bankers, Electric Protective Company, same place. Filed July 29, 1897.
650, 172. Telegraphic Sounder. Allen A. Dittmar, Jersey City, N. J., assignor to the Manhattan Electrical Supply Company of New Jersey. Filed Feb. 26, 1940.
650, 188. Phonograph. John Oertly, Cincinnati, O. Filed Nov. 13, 1899.
650, 219. Storage-Cell, Fred W. Barhoff, Hartford, Conn., assignor, to the Manhattan.

Nov. 13, 1899.

Storage-Cell. Fred W. Barhoff, Hartford, Conn., assignor to the Hartford Accumulator Company, same place. Filed July 29, 1899.

Storage-Cell. Fred W. Barhoff, Hartford, Conn., assignor to Charles E. Scholler, Philadelphia, Pa., assignor to Charles E. Wilson, same place. Filed May 20, 1899.

1899.
650,274. Voltaic Battery Operated with Fused Materials.
William S. Rawson, London, Eng. Filed June 19, 1899.
659,275. Electric-Light Dimmer. Henry E. Reeve, New York City, assignor, by mesne assignments, to the Electric Regulator Company of New Jersey. Filed Aug. 25, 1890.

1899. 305. Composition for Exciting Fluid for Flectrical Bat-teries. Frank G. Curtis, Everett, Mass., assignor to the Automatic Electric Pump Company, Boston, Mass. Filed

Automatic Electric Pump Company, Boston, Mass. Filed Aug. 21, 1899. 35%. Fire-Alarm Telegraph Apparatus. William H. Kirnan, Bayonne, N. J., assignor to the Gamewell Fire Alarm Telegraph Company, New York City. Filed Oct. 13, 1809.

# GENERAL NEWS.

# What is Going On in the Electrical World.

#### LIGHTING.

Alexandria Bay, N. Y.—The St. Lawrence International Electric Compay, recently formed here, has been reorganized, and its capital stock increased from \$20,000 to \$30,000. The lighting capacity of the plant will be eniarged at once to 6,000 lights, giving a total of 8500 lights, and cables will be laid to the islands in the vicinity of the place, while the plant will be equipped with new boilers and apparatus. Jacob Amos of New York is president. of New York is president.

Allentowa, Pa - Tae city councils recently entered into a ten-year contract with a local company to light the city with electricity at \$74.50 per arc lamp a year.

Arcadia, Fla.—The citizens are agitating the question of building an electric light plant

Ashland, Ill.—An electric light plant will soon be installed here. The people have already appropriated \$5,000 for the enterprise. Address Dr. D. S. Gailey, president of village board.

Barrien Springs, Mich.-An electric light plant will soon be erected here.

Chrisfield, Md.—Bids will be received until June 15 for the erection of an electric light plant. Address, J. H. Fontaine, secretary and treasurer of Chrisfield Ice Manufacturing Company.

Clinton, Ill—An electric light plant is to be erected here. Messrs. R. Saell and E. S. Nixon are interested. Corydon. Is —Bonds will be sold July 21 for erecting a municipal electric light plant to cost about \$12,000.

Eddwille Is. - At a recent election the citizens voted ond this town for \$7.000 for an electric light plant.

Ellensburg, Wash.—The municipal electric lighting plant here is to be improved at a cost of about \$3,000.

Florence, Ala.—This city will have electric lights within six months.

Frankfort, Ind.—This city will have a new electric light plant and will issue bonds amounting to \$40,000

Fredricksburg, Va.—The light committee of the city council has advertised for bids for the erection of an electric light plant.

Halifax, N S.—The council is considering the question of building an electric light plant.

Hastings. Nab.—The city council is making arrangebuild a new \$20,000 electric light plan

Kosciusko, Miss.—The Kosciusko Oil Mill & Fertilizer Company has purchased the city electric light plant and will improve, enlarge and operate the same.

Lake Charles, La.—This city will receive plans for its proposed electric light plant in about two months. Address, G. T. Bock.

Lexington, Miss.—The Lexington Ice, Light & Water Company will build an electric light plant and water works. Address H. W. Watson.

Ludlow, Vt.-The city council is discussing the question of erecting an electric light plant.

Mauning, S. C.—The citizens of this place are agitating the question of building an electric lighting plant.

Muskegon, Mich - The Muskegon Electric Light Company will make extensive improvements to its plant this season. A new battery of boilers and a new engine will be installed.

Neligh, Neb —This place is to have electric lighting in the near future.

Olivet, Mich — Plaus are being formulated for the erection of a new electric lighting plant at this place.

Owensbore, Ky.—Plans and specifications are being prepared for the erection of a new electric lighting plant at this place to cost \$49,000.

Plymouth, Wis.—The common council has voted to light this city by electricity.

Spencerville, O —The citizens of this place will soon ote on the question of issuing bonds for the construction of an electric light plant.

Wharton, Tex.—B. W. Farencamp of Shiner, Tex., contemplates the erection of an electric light plant

# STREET RAILWAYS.

Amsterdam, N. Y. - The Amsterdam & Hageman Traction Company was recently incorporated with a capital of \$100,000 to operate a street surface electric road five miles long, from here to the village of Hage-

Baraboo. Wis.—The question of an electric railway between Devil's Lake and the Dells is again being strongly talked of.

Bay City, Mich.—N. B. Bradley, B. Boutell, W. H. Hurley, M. A. Boot and A. C. Maxwell have been appointed as a committee to solicit aid for the proposed electric road to Sebewaing.

Cincinnati, O.—This city is considering the plan of operating one or more of its roads by electricity.

Crown Point, Ind.—Ed. Thistlewaite of Cedar Lake and a party of Chicago capitalists are figuring on an electric line from Cedar Lake to this place and thence

Dallas, Tex.—G T. Bishop, H. B. Coffinberry. G. F. McKay and J. Masterton are interested in the Dallas, Fort Worth and Southern Electric Bailway Company, which has a capital of \$1,000,000. The company contemplates the erection of an electric railway 32 miles long from here to Fort Worth, and of a line 28 miles long from Fort Worth to Cleburne.

Florence, Ala.—An electric railway system is to be established here within fifteen months.

Freedom, N. H.—A new electric railway is being considered in this section, designed to unite towns in Maine and this State now without railroad facilities, maine and this State now without railroad facilities, and the prospect is good for the building of the road at an early date. The proposed line will run from West Ossipee, on the line of the Northern division of the Boston & Maine, through Effingham Falls and this place, in New Hampshire, Porter and Kezar Falls to Cornish, Me.

Fremont, Neb.—Parties here are firm in the belief that the power canal will be an assured fact in the course of a year or two, and see no reason why the proposed electric road between this place and Omaha should not be built.

Niles, O.—A charter has been issued to the Mineral Bidge & Niles Traction Company for the purpose of building an electric railway line. The capital stock is \$50,000. The incorporators are A. A. Anderson, G. F. Arrel, J. E. McVey and H. M. Robinson.

Arrel, J. E. McVey and H. M. Robinson.

Hempstead, N. Y.—The Queens Borough & Nassau County Railway Company was incorporated a short time ago to build and operate a street surface electric road seven miles long, from this village to the village of Queens. The capital stock is \$150,000. Daniel Noble, Daniel Callanan of Long Island City, Patrick J. Mara of Fiushing, Frederick Bomley of Astoris. E. J. M. Kesver of Brooklyn, Henry P. Keith of Hempstead, John B. Merrill of Wood Haven, and Philip T. Cronin of Far Rocksway are the directors.

Johnstown, Pa.—Ry securing the vight of way

Johnstown, Pa.—By securing the right of way through the borough of Ferndale recently the last contacte was removed to the construction of the elec-tric car line from this city to Windber.

Kokomo, Ind.—The county commissioners have granted a franchise for an electric railway line to G. W. Landen of this city. C. E. Cowgill and J. Lyna, of Wahash, trustees for the Kokomo, Wabash & Northern Flatter, Belling of Control of the Control Electric Railway Company.

Nyack, N. Y.—It is stated that the franchises for a trolley line here will be purchased by Mr. Reeves, who will put the road through at an early date.

Wilmington, Del —The P-onle's Railway Company

withington, Del—The Propie's Kailway Company has received permission from the street and sewer directors to build trolley lines in this city. The new company is capitalized at \$750,000, and its officers are J. P. Allmond, president; L. H. Ball, secretary.

# MANUFACTURING.

Chattanooga, Tann.-G. N Henson of this city is in the market for a 70 light dynamo of 110 volts.

East Orange, N. J —The Explosive Vapor Company of this place was lately incorporated with a capital of \$300,000 to manufacture compressed air, electricity, etc. for motive power.

Hartford. Conn -A new company for the manuf ture of incandescent lamps has been formed here. John Camp of this city is interested in the concern.

Camp of this city is interested in the concern.

New Haven, Conn.—The Yale Motor & Power Company with a capital of \$500 000 was recently organized to manufacture and deal in motors, engines, etc. It is said that the company possesses a new patent in steam and electrical engines whi h is exceedingly valuable. The offi ere are Lucian M Foster of Buston, president; Henry W French, of Lexington, Mass., treasurer; and Willis A. Farnsworth, of New Haven, Conn., one of the directors. directors.

Richmond, Va.—A charter has been granted to the Virginia Conduit Company to manufacture electrical equipment and to operate an underground street railway. The capital stock is \$1,000,000. Bichmond, Va.-

# COMPANY MATTERS.

Champaigu, Ill —While the plant of the Champaigu & Urbana Street Bailway, Gas and Electric Company is undergoing repairs, it has been decided to rut in a dynamo especially to furnish at all times an alternating current, this having been provided heretofore only at night. at night

Pierre. S D.—W H Carlson and H C. Balcom are interested in the McCloud River Electrical Power Company recently formed here with a capital of \$1,500,000.

Pittsburg, Pa.—The Carnegie Steel Company has de-Pittsburg, Pa.—The Carnegie Steel Company has decided to make a complete change in the motive-nower system that operates its thirty-irch mill of the Homestead Steel Works. Electricity is to take the place of steam in the operations of the shifting tables at the rolls. This will take considerable time, as it means the replacing of this portion of the plant with entirely new machinery. The total expenditure for improvements to this mill is estimated at about \$200,000.

Barton, Md.—On account of the breakage of a pump at the Klondike mine the machinery is being repaired, and at the same time an electric plant is being in-



# THE TELEPHONE WORLD.

## Independent Telephone Officers.

The Indiana Mutual Telephone Association, composed of companies that are fighting the Central Union, have elected the following officers: President, John McGregor, Madison; vice-president, Charles M. Zion, Lebanon; secretary and treasurer, Harry B. Gates, Indianapolis; executive committee, John McGregor, Madison; Charles M. Zion, Lebanon; Harry B. Gates, Indianapolis; L. A. Frazee, Connersville; Hugh Dougherty, Bluffton; A. F. Ramsey, Crawfordsville; G. W. Beers, Ft. Wayne.

President Balfour of the Keystone Telegraph Company, the new independent telephone company which proposes to operate a system in Philadelphia, announces that the company will be ready to do business within a year. As was stated a short time ago, the company has acquired a franchise from the city to lay its conduits and wires, and the active construction will commence in a few weeks. The plans are now being drawn. The opponents say the Keystone Telephone Company will not be permitted to do business in the city without a legal contest. It is said that an attack will be made on its charter which it has taken out in New Jersey. The attorneys have taken the ground that a New Jersey company has no right to acquire vested rights in public roads and highways in

The Bell Telephone Company has completed plans for extensive additions to its service in the State of Wyoming. It will build a line north from Cheyenne to Casper, Douglas, Lusk, Glenrock, and on into the northern part of the State to Newcastle, Sheridan. Sundance, Buffalo and to Deadwood, and Lead City in the Black Hills. The company has planned to connect Lander, Thermopolis and Fort Washakie with the main line, through southern Wyoming, either at Rawlins or Rock Springs. It is predicted that inside of twelve months every town of any size in Wyoming will be connected with Denver on the south, and Salt Lake City and Ogden on the west by long distance telephone.

The officers of the Little Wolf Telephone Company have not yet filed their acceptance of the franchise recently granted by the council of the city of Oshkosh, Wis. The council passed the ordinance granting the Little Wolf Company a charter two weeks ago and about two weeks still remain in which to file an acceptance and a bond for the performance of the work, according to the charter. The franchise calls for the completion of an exchange by January 1, 1901.

It is stated that the People's Mutual Telephone Company recently organized in San Francisco, Cal., has contracted for \$300,000 worth of material. It is the purpose to put in an improved Bell telephone system, and the rates will be 60 per cent. lower than those now charged in San Francisco. Work will be commenced before July 1.

The Weakley County Telephone Company of Martin, Tenn., which was incorporated in March, 1839, is branching out, and arrangements are being perfected whereby it will take in every town in Weakley County. The company has been in operation nearly one year, and has already earned a dividend of something like 20 per cent.

The application of the Home Telephone Company for a franchise in Columbia, S. C., has been unfavorably reported on by the street committee to whom the matter was referred.

At a recent meeting of the stockholders of the People's Telephone Company of Biloxi, Miss., it was decided to sell the exchange to the Cumberland Telephone Company. The latter corporation expects to take charge of the system and refit it at once.

The Southeastern Massachusetts Telephone Company has been granted the right to erect poles in Brockton, Mass. The company is constructing a telephone line from Wareham to Boston.

The New York and New Jersey Telephone Company is making arrangements to establish a local telephone exchange in East Hampton, N. Y. If the company can secure twenty subscribers an undergr und system will be put in.

It is stated that B. F. Thompson and W. B. Hunt are planning to build a telephone system in Scottsboro, Ala. Quite a number of prospective subscribers have already been obtained.

The town of Schaller, in Sac County, Iowa, with a population of 400, is about to put in a telephone system.

## Damage Suit Against the Bell Company.

George C. Stone, a resident of Thomasville, Ga., has brought suit in the United States Court against the Southern Bell Telephone Company to recover \$26,900 damages.

The plaintiff alleges that he was a subscriber to the telephone company, as was also the Thomasville Fire Department, and that it was the business of this company to furnish to each of its subscribers means of communication at all hours of the day and night. This they failed to do, the plaintiff alleges, by reason of which his house was destroyed by fire, he being unable to raise the central office to get the fire department.

Advices from Duluth, Minn., state that Judge Lochren of the United States Court has granted a temporary injunction in the case of the Duluth Telephone Company against the City of Duluth. The suit is brought to enjoin the city from removing the poles and wires of the old company, whose franchise ran out last year. The city made a contract with the Zenith Telephone Company, and is seeking to oust the old company. The Duluth Company claims that it has an irrevocable contract with the State under the general law that gives telephone and telegraph companies the right to the use of roads and highways, claiming that streets are included in that term. The case is practically the same as that recently decided in the district court in Minneapolis. It will come up in the fall and in the meantime the company is restrained from extending its service.

The subscribers of the Cumberland Telephone Company at Lynnville, Tenn.. have been notified that after June 1 they will not get Maury County on the exchange as heretofore. This will greatly inconvenience people generally, and especially business men. Dissatisfaction is being expressed on all sides over the change. A petition has been drawn up and signed by the local subscribers asking the managers to withdraw their orders, and permit them to use the lines as at present. If the petition is not granted a number of withdrawals will immediately take place. The company has a large exchange at Lynnville, and the patronage has always been liberal.

An independent telephone company has purchased the existing rights and line of the Saco and Biddeford Telephone & Telegraph Company, and proposes to begin business in Saco, Biddeford, Old Orchard and Biddeford Pool, Me., in the near future. The new company is composed of George F. West of Portland, Carlos Heard, E. W. Staples, Jere G. Shaw, Charles H. Prescott, and Charles E. Atwood of Biddeford, Hampden Fairfield, Luther R. Moore, A. G. Prentiss and Herbert R. Jordan of Saco.

A dispatch from Peabody, Kan., states that every town and village in Marien County is equipped and connected with a local and a long distance telephone system. The Southwestern Telephone Company, of which H. D. Wells is president, and Charles Sawtelle, treasurer, have 150 'phones in Marion, 125 in Peabody, and a number in Hillsboro and the smaller towns of the county.

Senator Chauncey M. Depew, president of the Transportation Club of New York, addressed that body at its annual dinner last week at the Hotel Manhattan over the long distance telephone from his residence in Washington. It is something like 225 miles from New York to the capital; and it is said that this is the first instance of a speech being made over the telephone at so great a distance.

The Saline County Telephone Company has extended its line from Marshall to Miami, Mo. In a short while its toll lines will reach all towns in Central Missouri. The company was organized last September, and now has in use 328 between the company was set of the company was organized last September, and now has in use 328 between the company was set of the company was organized last September.

The telephone system at Lake Charles, La., is being improved. A considerable amount of cable has been delivered there, and the work of reconstructing has begun.

Five hundred electric wire linemen in Cleveland, O., went on a strike last week. Of them 420 are employes of the Telephone Company. They want \$2.50 for an eight-hour day.

The continual growth of the business of the Southern New England Telephone Company and the constant enlargement and development of its plant has decided it to issue \$100,000 of its first mortgage 5 per cent. bonds.

The American Telephone Company has received a permit to build its pole line from New Lenox, Mass., to the Lee town

The Get'vshurg, Pa. "Sentinel" says: "Few persons have any idea of the number of telephone subscribers connected by toll lines and by direct connection with the Gettysburg exchange. These number no less than 5,400, divided as follows: Adams County Company, 300: Hanover Company, 300; York County, 1,400; Lancaster County, 1,400; Cumberland County, 550; Franklin County, 650; Lebanon, 300; Harford County, Md., 150; Hagerstown, 350. Negotiations are being made for additional extensions and connections with independent companies in Pennsylvania and Maryland, and it will not be many months before the independent companies have long distance service equal to that of the Bell Company. There are in the independent telephone service in Pennsylvania and New Jersey 40,000 'phones now in use and the number is increasing daily. Of the 67 counties in Pennsylvania 57 have independent companies, and of the 21 counties in New Jersey 18 have independent service. Movements are on foot that will connect all of the greater part of these companies. In Philadelphia it is expected that the granting of a franchise to the Keystone Company means the introduction of independent service in that city, which will then also be connected with the independent toll line service. The Home Company of Baltimore is pushing out its lines, and very soon that ci'y will be a center of independent long distance telephone service."

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The Rawson Electrical Company of Ohio, which concern is the parent of the Home Telephone Company of Niagara Falls, was granted a franchise in North Tonawanda, N. Y., recently. The application of the Bell Company for a similar franchise was turned down. The granting of the franchise, which was unanimous, means cheaper telephone service for the Tonawandas, and a death blow to the Bell Company in that city. The franchise granted was on the condition that the independent company complete its lines within one year, and not charge more than \$36 a year for rental of a business phone and \$18 a year for private house instruments.

The new Lackawanna Telephone Company, which is under the same management as the People's Telephone Company of Wilkes-Barre, Pa., has filed a mortgage of \$500,000 in favor of the Anthracite Savings Bank of Wilkes-Barre. The mortgage is to guarantee an issue of 5 per cent. thirty year bonds to that amount. The money will be used for constructing the company's plant in Lackawanna County. The issue was authorized at a meeting of the directors April 23 last, when the capital stock was increased from \$10,000 to \$600,000. The mortgage required \$250 in revenue stamps.

Articles of incorporation for the West Salem Telephone Company have been filed with the register of deeds, at La Crosse, Wis. The incorporators are William Lohmiller, J. G. and C. H. Schweizer. The company will establish an exchange at West Salem, and will also connect with the line of the La Crosse & Southern Telephone Company. Work has already begun on the construction of the system.

The Hampden Automatic Telephone Company, through a third party, is said to have purchased a valuable site in Springfield, Mass., and will erect an office building, reserving for its own use the upper stories. The building will be the local central office and also county headquarters. The backers of the company claim that its lines will be in operation within a few months.

A company has been organized at Troy, Kan., to construct a telephone line from Atchison, Kan., to Falls City, Neb. The work will be commenced in a very short time, and the following towns will be connected by the system: Atchison, Doninan, Brenner, Troy, Farmington, Highland Station, Highland, Iowa Point, White Cloud, Rulo, Reserve and Falls City.

# TELEPHONE INCORPORATIONS.

The Springer & Millshoals Telephone Company, Springerton, Ill. Capital stock \$2,500. Incorporators: John W. Springer, John N. Upton, and L. W. Hendershott.

The New Prague Telephone Company, New Prague, Minn. Capital stock, \$10,000. Incorporators: S. A. Vopatak, J. F. Barta, M. Rybak, all of New Prague.

The Smith-Lake Telephone Company of El Dorado, Ark. Capital stock \$15,000. Incorporators: E. H. Smith, J. A. Rowland and E. H. Lake.

The Akron People's Telephone Company, Akron, O. Capital stock, \$200,000. Incorporators: W. Christy and A. B. Conklin.

The Jefferson Telephone Company, Guthrie, Ok.—to build and operate a telephone system throughout Oklahoma and In lian Territory. Capital stock, \$10,000. Incorporators: D. M. McKinstry, E. D. Nims, John M. Noble, E. E. Westervelt, Perry; F. D. Hummer, Washington, D. C.; W. E. Cald well, Louisville, Ky.



# LECTRICA SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electractry from a variety of sources.

The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem is a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; extension; gcn., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

# STOCKS.

PASSE	NO	ER R	AILW	AYS.		PASSENGER RAILWAYS.								
NAME:	Par	Capital Authora'd		Bate and Date of Jast Div.					Capital	Stock.	Bate and Date of Last Div.	Bid.	Anked	
Albany, N Y May 26 United Traction		<b>\$</b> 5, <b>000,00</b> 0	\$5 000,000	1 <b>% % Q.</b> ,	124	125	Hartford Conn.—May 28: Hartford Street By. Co	100 100	\$4,000,000 1,000,000		8 % 8., Oct.,	150	=	
Troy City Bailway.)  Allentown Pa.—May 28							Holyoke Mass.—May23 Holyoke Street By. Co Hoboken, N. J.—May 28		400,000	<b>400,00</b> 0	8 % A., June,	2073	212	
Allentown & Lehigh Val. Trac. Co. Bridgeport, Conn—May 28:		4,000,000			-	15	North Hudson Co. (N. J.) Ry. Co Indianapolis, Ind-May 28.			i .		150	-	
Baltimore Md.—May 28		2,000,000		1 % Aug.,	105	181/4	Lancaster, Pa.—May 28 Pennsylvania Traction Co		5,000,000 10,000,000	5,000,000 9,900,000		24	24 >	
BOSTON, MASS.—May 28 New England Street Ry				1 % Q., Jan.15,			Lancaster & Col. Electric By West End Street Railway		10,000,000	87,500	******************		=	
North Shore Traction Cocom North Shore Traction Copfd b West End Street Ry. Cocom West End Street Ry. Co & pfd. Boston Elevated B. R.	100 100 50	0 4,000,000 2,000,000 10,000,000 6,400,000 10,000,000	4,000,000 2,000,000 9,085,000 6,400,000	6 % S., A. & O. 8 % % S., Oct., '19. 4 % S., Jan. 2 % % Aug. 99,	15 85 93 112 144 ½	16 87 94 114 145	Louisville, Ky.—May 28 : Louisville By	100	2,500,000		1½ %., April. 2½ % S., Oct. 1,	78 110	79 111	
Brooklyn N. Y.—May 28: Brooklyn City By Brooklyn Rap. Transit Co., tr certf.  Brooklyn Heights Railroad	100	2,000,000 43,000,000 200,000	48,000,000 200,000	***********	281 503 107	236 70% 109	Twin City Rapid Transitcom Twin City Bapid Transit % pid Montreal, Canada.—May 28 Montreal Street Ry. Co	50	4,000,000	4,000,000	1% %, Oct. 8 % S., M. & N.	136 21 <sup>13</sup> 4	187 249	
*dBrooklyn Oily RRgual Brooklyn Queens Co. & Sub. RR. Coney Island & Brooklyn RR Kings County Rlevated Kings County Traction Co	100	2,000,000 2,000,000 4,750,000	1,884,200 4,750,000 4,500,000	2½% Nov., 99 1% July	247 325	289 820	Memphis Tenn.— May 28: Memphis Street Railway Co			6,000,000 600,000	15/ % S., J. & J.	96¾ 26	963	
Nassau Electric Railroadpfd. /Atiantic Avenue Railroad gBrooklyn, B. & W. E. Railroad Buffalo N. Y.—May 28:	50	6,000,000 2,000,000 1,000,000	2,000,000	• • • • • • • • • • • • • • • • • • • •	75	80	New Haven, Conn.— May 28.  Fair Haven & Westville RR New Haven & Centerville Winchester Avenue RR	100	1,250,000 700,000	<b>800,0</b> 00	8 % S., Sept.	89  45	41	
Buffalo & Niagara Falls Rico, Ry *Buffalo Railway Co				1 % Q. Dec., 99.	99	75 100	New Orleans, La.—May 28	40	240.000		4 % S., July, 1% % Q., Oct.			
Columbus Street Railroad				1 % Q., Feb.	26 85	28 88	New Orleans & Carroliton RB.  New Orleans Traction Co new com New Orleans Traction Co new pfd. aCrescent City RR.  bNew Or. City & Lake RBguar	100 100 100	2,000,000	•••••	***************************************	148 % 22 % 95 20 %	1	
Charleston City Ry. Co	50 26	100,000 1,000,000		8 % B.	=	::	St. Charles Street Railway	50	500,000 1,000,000		8 % S., Jan., 4 % S., Jan., 1 ½ %., June, 1 ½ %. Oct.,	56%	52 87	
Chicago City Ry. Co. Cnicago & South Side R. T. RR. Lake Street Elevated RR. Metropolitan West Side Elev. Ry Met. West Side El., pfd. North Chicago Street RR. ANorth Chicago City RR. South Chicago City Rallway. West Chicago St. RR. Co Union Traction Ry	100 100 100 100 100 100	10,828,800 10,000,000 15,000,000 15,000,000 10,000,000 2,000,000 20,000,000 1,250,000	10,828,800 10,000,000 7,000,000 9,000,000 6,600,000 249,900 1,608,200 18,189,000 624,900	Feb 28 1900.  8 % Q., Jan.  11/4 % Q., Feb.  85 %	264 87 80% 221  110 24 76%	28 801/s 227	Central Crosstown RR.  cChristopher & 10th Sts. RR. guar Dry Dock, E. Brdwy & Battery RR dMetropolitan Street Ry. Co.  eBleecker St. & Fulton Fy. Ry. guar /Broadway & Seventh Ave guar gCen. Park, N. &E. Rivers RR. guar AEighth Avenue RR. 412d St. & Grand St. Ferry RR. guar /Sinth Avenue RR guar /Sinth Avenue RR guar /Sinth Avenue RR guar /Sinth Avenue RR guar /Sinth Avenue RR guar	. 100 . 100 . 100 r 100 r 100 r 100 . 100 r 100	750,000 800,000 2,000,000 600,000	748,000 800,000 2,000,000 600,000	4% % Q.	270 175 100 1543/4 85 230 159 195 896 198 205 400	800 185 1243 155 86 240 201 400 410 205 210 405	
Cincinnati, Ohio.—May 29: Cincinnati Inc. Plane Bycom Cincinnati Inc. Plane Rypfd Cincinnati, Newport & Cov. St. By. ICincinnati Street Ry. Co	50 50 100	1,000,000 150,000 8,000,000 18,000,000	575,000 150,000 8,500,000 14,000,000	% % Feb. 2% % Feb. 1% % Q., Jan. 1% % Q., Jan.	75 124 %	76 12;	Second Avenue RR. Phird Avenue RR. M42 St., Manhatv'le & St. Nich. Av "Union (Huckleberry) Ry. Newark N. J.—May 28:	100 100 100	2,500,000 <b>2,000,00</b> 0	2,500,000 2,000,000	***************	199 118% 10 190	201 11£7/ 60 200	
Mt. Adams & Eden Park Inc. Ry. CTBVeland, Ohio.— May 28 Arron, Bed. & Olev. Ricc. By Oleveland City By Cleveland Electric By	100	1,000,000	1,000,000 7,600,000	1½ % Q., Jan. % % Jan. 8-5 % Jan. % % Q., Oct., '99	48 100 87	50 101 58	Consolidated Traction Co. of N. J North Jersey Street Railway Co. United Electric Co. of New Jersey Pittaburg, Pa.—May 28; Allegheny Traction Co	100 100 50	6,000,000 504,000	6,000,000 <b>504,00</b> 0	11% % A.	57 27 2854 55	58 273 241 56	
Detroit, Mich.—May 28. Detroit Citisons' Street Ry	100	2,000,000 250,000 1,000,000	1,250,000 1,200,000 250,000 1,000,000	************	1003; 175 90	 100 110	oConsolidated Traction Cocom. Consolidated Traction Copfd. pCentral Traction Co qCitisens' Traction Co rDuquesne Traction Co sPittsburg Traction Co Federal St. & Pleasant Valley Ry.	50 50 50	9,478,850 1,500,000 8,000,000 8,000,000	9,000,000 1900,000 18,000,000	2 %, Jan. 8 %, Nov. 1 % % Nov. 6 % A. 6 % A. 8 % %, Nov. 2 % %, July,	27 (3½ 69 12½ 12½	263/ (33/ 70 123/	
Dayton O.—May 28 City Railway Cocom. Oity Railway Copfd. People's Street Railwaypfd.	100		1,470,600 600,000	12 × 2	140 170 114	145 1i5	Pgh., Allegheny & Man. Trac. Co Pitsourg & Birmingham Trac. Ry. Pitsburg & West End Ry. United Traction Co	50 25 50 50	8,000,000	1,500,000 8,000,000 17,000 000	2%, Aug. 1%, Oct. 5% A., June J. & J.	41 518/8	<b>i</b> 233 1134	

\*Unlisted. † Ex div.
a The United Rallways & Electric Company comprises in its organization the Baltimore Onsolidated Rallways & Electric Company comprises in its organization the Baltimore Onsolidated Rallway Company, the Baltimore Oity Passenger Railway Oompany, all the lines of street railway operated by these companies, and also the Central Railway Oo of Baltimore. The pref. stock of U R & Elec. Co. has been issued in the form of income bonds. b Leased to Buston Elevated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Buston Elevated Railroad Co., which guarantees 10% on capital stock.
Stock owned by Brooklyn Rapid Transit Ompany; road operated by Brook yn Hist. Co f Stock owned by Rings County Traction Company; road leased to Nassau Electric RR g Owned by Atlantic Ave. RR. and leased to Nassau system.
h 330 per share on outstanding capital ps'd as rental by leasee — West Ohicago St. RR. Oo.
\$250,100 of stock owned by North Chicago Street Railroad Company.
c Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Ohicago Street Railroad Tunnel Company.
5 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$250,100 of stock owned by Chicago Street Railway Ompany; \$250,100 of stock owned by Chicago Street Railway Company; \$250,100 of stock owned by Chicago Street Railway Company; \$250,100 of stock owned by Chicago Street Railway Company; \$250,100 of stock owned by Chicago Street Railway Company; \$250,100 of stock owned by Chicago Street Railway Company; \$250,100 of stock owned by Chicago Street Railway Company; \$250,100 of stock owned by Chicago Street Railway Company; \$250,100 of stock owned by Chicago Street Railway Company; \$250,100 of stock owned by Chicago Street Railway Company; \$250,100 of stock owned by Chicago Street Railway Company; \$250,100 of stock owned by Chicago Street Railway Company; \$250,100 of stock owned by Chicago Street Railway Company; \$250,100 of stock owned by Chicago Street Railway Co

\*\*Unlisted. † Full paid. | Outstanding. † Ex-div.
a Lessed to New Orleans Traction Company at 6 % on stock.
b Lessed to New Orleans Traction Company at 8 % on stock.
b Lessed to New Orleans Traction Company at 8 % on stock.
c Lessed to Central Orosstown Ratiroad at 8 % on stock and interest on bonds.
d Operating the former Med. Trac. system, that corporation having become extinct.
c Lessed to Zid Street Ry. for 99 years; lesse assigned to Metropolitan Street Ry.
f Lessed to Houston, West Street & Pavonia Ferry—now Metropolitan Street Ry.
f Lessed to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.
f Lessed to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.
f Lessed to Metropolitan Street Railway for 18 % on capital stock.
f Lessed to Metropolitan Street Railway for 18 % on capital stock.
I Lessed to Metropolitan Street Railway for 18 % on capital stock.
Controlled by Third Avenue Railway for 18 % on capital stock.
Third Avenue Railway for 18 % on capital stock.
Outrole by lesse the Alleg'ny, Cent., Citizens' Duqueene, Fort Pitt & Pitt'n Traction.
p Lessed to Consolidated Traction Company for 8 % per annum on par value of stock.
T Lessed to Consolidated Traction Company for 6 % on \$3,000,000 capital stock.

\*\*Lessed to Consolidated Traction Company for 6 % on capital stock.

\*\*Lessed to Consolidated Traction Company for 7 % en capital stock.

\*\*Lessed to Consolidated Traction Company for 7 % en capital stock.

PASSE.	NG	ER I	RAILW	AY <b>S.</b>			TELEPHONE AND TELEGRAPH CO						
		Capital	Stock.	Data c=3 m · · · ·					Capital	Stock.	Pete c=2 P c c		
name.	Par	Authors'd	Issued.	Rate and Date of Last Div.	Eid.	Asked.	name.	Par	Authors'd	Issued.	Bate and Date of Last Div.	Dis.	يبي
New Bedford Mass-May 28							Boston, Mass May 28	Π	[		1		<del> </del>
Union Street Railway Co Northampton, Mass-May 28	100	\$850,000	\$850,000	2 %, Feb.	160	165	American Bell Telephone Co Eric Telegraph & Telephone Co New England Telephone Co	100 100	10 894 600	28,650,00	1 % Q., Jan. 1 % Q., Feb. 20, \$1.50 p. sh. Feb	308 101 184	810 102 18434
Northampton Street Rv	100	800,000	225,000	4 % A., June.	179	178	New York.—May 28						
Omaha, Neb May 28; Omaha Street Ry	100	5,000,000	5,000,000	8 % A. and N.	55	65	American Telegraph & Cable Co *Central & South Am. Teleg. Co	100 100	14,000,000 6,500,000	14,000,000 6,500,000	1××9.	91 104	94 106
Paterson, N. J.—May 28: Paterson Rv. Co	100	1,250,000	1,250,000		54	_	*Commercial Cable Co2½ % guar. Franklin Teleg. Co2½ % guar. Erie Telegraph & Telephone Co	100   100   100	1,000,000	10,000,000	IX X Q.	91 104 165 42 113 118	100
Providence, R. L-May 28:			8 000 000	% %, Oct. '98	109	111	*Gold & Stock Telg. Coguar. 6 %.   *International Ocean Tel Co.guar 6%	100 100	5,000,000 8,000,000	******	IX X Q IX X Q IX X Q IX X Q IX X Q IX X Q	118	100 100 100 100 100 100 100 100 100 100
United Traction & Electric Co Philadelphia.—May 28	1	,	' '			ł	Mexican Telephone Co	100			2% % Q., Jan., *99. 2 % 8. 1 % Q.	-	
Fairmount Park Trans. Co\$50 pd. Hestonville, Man. & Fairmount	50 50	2,000,000 1,966,100	1,770,000 [1,966,100	2 %, Dec. '(9. 2 % %, July 15, '(9. 8 % Feb. 1, '(9. 	28 47 76	24 48 76	*Postal Telegraph Cable Co  *Sout'n & Atlantic Telg. Co.guar.5 %	100 25	950,000	15,000,000 559,525	12% % & B.	<b>75</b>	
Hest'nvl'e, Man. & Fairm't6 % pfd. «Fairmount Pk. & Had. Pass. Ry. Union Traction Co	50 50	800,000	800,000 29,980,450	8 % Feb. 1, 199.	<b>75</b> 87	76 87 %	†Commercial Union Telegraph Co Western Union Telegraph Co †Div. guar. by Postal Teleg. Co.	25 ••	500,000	97,870,000	1% %, Q, Jan. '99.	115 79%	79%
dCitizans' Passenger By		000,000		\$8 share Q. \$14 sha'e A—Apr.59		 451	Miscellaneous.—May 28:					· ·	<u>.</u> ,
eFrankford & Southwark Pas. R (Lehigh Avenue Ry. Co (Lombard & South Street Ry	25	1,000,000	1 000 000		90	901	American Dist. Teleg. (Phila.) Bell Teleph. Co. (of Canada.) Chesapeake & Potomac Telep. Co	26 100 100	400,000 8,960,000	8,561,000	1 X Q.	98 198 61 99 146 99 190 191	2
dSecond & Third Streets By	50 50	1,060,000	1771,076 16,000,000	\$9 share A, Mar. 98 8 %, A., April, '98. \$5.25 share—1898.	150	 151	Chicago Telephone Co	100	750,000	750,000	••••	Ž,	選
gGermantown Passenger Ry gGreen & Coates Passenger Ry. hPeople's Passenger Rycom.	50 50 25	800,000	150,000 1740,000	8 % Jan., 1898.	151	152	Empire & Bay States Telegraph Co. Hudson River Telephone Co *Northwestern Telegraph Coguar	100 50	2,000,000 2,500,000	2,000,000	1 % Q.	190 190	
APeople's Passenger Kypid.		750.000	1277 402	\$2 p. sh., Oct. 98. 6 % A—Mar., '98.	96	 96¼	Providence (R. I.) Teleph. Co Southern New Eng. Teleph. Co	50 100	8,000,000	******		9434	7
Oatherine & Bainbridge St Oontinental Pass. Ryguar (Empire Passenger By. Co	50 50	1,000,000 600,000			158	157	ELECTRIC LIGHT	1/	D ELL	EOTR	ICAL MFQ.	. 0	08.
Philadelphia & Gray's Fy. RR	50 50	1,000,000 1,000,000		\$7.50 share July '98 \$8.50 share July '98		2081/4	Boston, Mass.—May 28:					17#	
Ridge Avenue Passenger Ry Philadelphia & Darby Ry.guar. 17th & 19th Sts. Pass. Ry. guar	50 50 50	750,000	420,000 200,000 250,000	\$12 share, July '98. \$2 share July, '98. 14 % S., July, '98.		809	Fort Wayne Electric trust receipts Ft. Wayne Elec Co. T. Sec. Series A. tGeneral Electric Co. [old] com.	25 100	40.000.000	80,460,000	l l	115 36	**
Thirteenth & 15th Sts. Pass. Ky.	50 50	1,000,000 1,500,000	885,000 900,000	1½ % 8., July, '98. \$11 sh. A., July, '58 \$9.50 shre, July '98	800 389	240	General Electric Co. [old] com. General Electric Co. [new] " TH. Elec. CoT. Secur., Series D.	••	•••••		2 % Q., Aug., 1998. 1% % Q., Jan., 1900	188	188%
iWest Philadelphia Pass. Rv Rochester, N. Y.—May 28	50	750,000	1750,000	\$10 share, July '98	201	268 -	Westinghouse Elec. & Mig. Co. com. Westinghouse El. & Mig. Co. pid. Westinghouse El. & Mig. Co. assent.	50 50	4,000,000 11,000,000	146,700 8,996,058 8,195,126	1% % Q., Jan.,	61 43	4
Rochester Railway Co	100	5,000,000	5,000,000	*****	17	18	New York.—May 28: Edison Elec. Ill'g Co., New York						
Reading, PaMay 28  Beeding Traction Co	<u></u> .	1,000,000	1,000,000	Semi-an.,Jan. & Jy	24 188	26	*Edison Elec. Ili'g Co., Brooklyn Edison Ore Milling Co	100 100 100	9,188,000 4,000,000		1½ % Oct., '98.	119 	120 12
Rast Reading Electric By	50 50	1,000,000	\$50,000 \$1,000,000	Jan., '98. Jan., '98.	70		Electric Vehicle Cocom.   General Electric Co. [old]com   General Electric Co. [new]"				2 % Q., Aug., 1898. 1½ % Q., Jan., 1900.	82	86
St. Louis MoMay 28 Fourth Street & Arsenal Ry Jefferson Avenue Ry. Co	50		150,000			-	Interior Conduit & Insulation Co  Kings Co. El, L. & P. Co	100 100 100	1,000,000	18,276,000 1,000,000 2,500,000	•···•	41 110	199% 198
Lindell Ry	100		2,400,000 2,400,000 2,479,000	2 % Dec., 1888. 1½ % Jan., '99. 1½ % Jan. '99.	::	••	Pittsburg, Pa.—May 28						
Cass Avenue & Fair Grounds Citisens' RR	۱	2,500,000 2,000,000	2,500,000 1,500,000	4 %, Oct., '98.	::	:-	Liegheny County Light Co	100 50	500,000 800,000	500,000 800,000		100	172 
Missouri BR	50	2,400,000	2,000,000 2,800,000 800,000	1%, X Jan. '98. 4 %, Oct., '98. 2½, %, Jan., '99. 1½, % Jan., '99. 50c., Dec., '89.		::	Philadelphia, Pa.—May 28 Edison Electric Light Co	100	2,000,000		•••••	144	144% 89%
United Electric Ry	50 100	500,000 1,000,000	1,000,000	8 %, Jan., '99.	28¾ 18	21 78%	*Electric Storage Battery Cocom. *Electric Storage Battery Copfd. Northern Elec. Light & Power Co	100 100	8,500,000 5,000,000 550,000		******	87 84 18	78% 88%
t. Louis & Suburban Ry Union Depot RR	100 100		1 2.500.000	8 % A., July, '(9	68	10	Southern Elec. Light & Power Co Miscellaneous.—May 28:	10	187,500	187,500	••••	<b>5</b>	=
San Francisco, Cal.—May. California St. Cable RR	100		600,000		117	119	Bridgeport (Conn.) Elec. Lt. Co	25	500,000	••••	••••	5	
Heary Street Park & Ocean RR Market Street Ry Presidio & Ferries RR	1 100	18,750,000	18,750,000	\$2.50 share, '96. Q., 60c. per share.	61½	68¾ 16	Eddy Electric Mfg. Co	25 100	850,000	*****	••••	47 99 180 180	M:SERBE
Scranton Pa -May 28.			!				Hartford (Conn.) Lt. & Power Co New Haven (Conn.) Elec. Lt. Co Narragansett (Prov., R.I.) Elec. Co. Rhode Island Elec. Protec. Co	25 100 50	175,000 100,000 1,200,000		2 % Q., Oct.,	195 98 1184	2
Beranton Railway Co	100	500,000	500,000		29 16½		(  ELOYAL Edge, Co. (Montesa)		1.000.000		1% 9	201	202
Springfield III.—May 23:							Toronto (Canada) Elec. Light Co Thomson-Houston Welding Co Woonsocket (R. I.) Electric Co	100 100	1,085,000	1,085,000	8 % 8, Dec. 1, 96.	182 165	182%
Springfield Consolidated By Springfield OMay 28	100	750,000	750,000	*********			tOn Ang. 17 last by a majority vot	e of	the stock	holders 1	he central shock we	a rad	trood div.
Springfield Street Ry	100	1,000,000	1,000,000	*******		11	to \$20,827,200, of which \$18,276,000 is c Recently acquired the Edison Ill pany, the Municipal Electric Light	umi Co.	nating Co.	of Brook	lyn and its constit	uent	-
pringfield Street Ry	100	1,200,000	1,166,700	8 <b>% A</b> .	207	212	ALLIE	D	INDU	STRIE	:s		
Toronto Canada.—May 23 Toronto Street By	100			1% % 8.	93	100	Boston Mass.—May 28: American Electric Heating Co	, KO	10,000,000			_	] :-   =
Montreal Street Bailway Co		4,000,000	4,000,000	4 % S.	258	2541/4	Street Ry. & Illu'g Propertiespfd United Electric Securities Copfd.	100	4,500,000	1,248,700 1,000,000	\$2 p. sh. Jan. 26, '99 \$8,50 p.sh. Nov '99	12	10 M
Belt Ry. Co	50 100	112,000,000	12,000,000	65c. per sh, Oct. \$9.	10434	105	New YorkMay 28:				-		
Columbia Ry. Co	50	707,000	400.000	6% Å.	25 15	40 16	Consolidated Electric Storage Co			******			19
Georgetown & Tenallytown Ry Vetropolitan RR. Co			458,900	2% % Q.		10	Safety Car Heating & Lighting Co   Worthington Pump Cocom.	100	5,500,000	5,500,000	•••••	100	
*Worcester Traction Cocom	100	8,000,000	8,000,000	8 % S., Feb., '98.	81	82	Worthington Pump Copfd Philadelphia Pa.—May 23	100	2,000,000	2,000,000	T X A	-	<b>D</b>
Wercester Traction Co6 % pfd. Wercester & Suburban Street Ry			542,500	8 % 8., Feb., '98. 4% %, 1897.	1043	106 85	Electro Pneumatic Trans. Co United Gas Improvement Coscrip.	10 50	1,500,000 10,000,000			3%	- Mark
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1%, Jan.,	25	29	Welsbach Commercial Cocom. Welsbach Commercial Copfd. Welsbach Light Co	100 100	8,500,000 500,000 525,100		2 X Q	90 78	16 16
* Unlisted. † Paid in. † Full a Leased to Hestonville, Man &	paid k Fa	l.   Outel	anding.	Ex-div. By, for 6 % on stock	per i	annum.	Welsbach Light Co., Canada	5	500,000		••••	13%	1%
charges and all indebtedness of	cour obie,	s and Pr	illadelphii id leased	a Traction compan companies assume	nies. d by	Fixed Union	Pittsburg, Pa.—May 38: Carborundum Mig. Co Standard Underground Cable Co	100 198	200,000 1,000,000	200,000 1,000,000		. <del></del>	192
d Lesse to Frank ford & South	by t Wark	Juion Trad Passenge	otion Com	DANT			Miscellaneous.—May 28:				_		•
Controlled by Frankford & S	om)	eny. Wark Pas	senger Re	ilway			*Barney & Smith Car Cocom, *Barney & Smith Car Copfd. Billings & Spencer Co	100 100 25	*****	1,000,000 2,500,000		1434 184	196
Leased to People's Passenge A Majority of stock owned by Leased to Union Traction Co	m na	N W					Consol. Car Heating Co	100 100		1,250,000	1% % Feb	108 1	# 100
# Leased to United Traction (	om	on Compa	ny. rental of	\$10,000 per annum	in in	1866-7-8	*Pratt & Whitney Coom.  *Pratt & Whitney Copfd Stillwell-Bierce Copfd	100 100	•••••		==	3	4 50
declared as a dividend semi-annu	ily.	Peedine T	rection C	payable semi-ami		TOH SEL	Stillwell-Bieros Copfd.	100	<b>5</b> 00,000		2 % Sept 1,'99,	228	4 50 50 65 70
Dividend of 6 % guaranteed Leased and operated by the f	by H	ending Tr sion Raily	action Co	mpany. Ermerly Scranton T	zacile	on Co,	St. Charles Car Co	~	*******	*********		<b>39</b>	<b>155</b>

# BONDS.

PASSEN	- R						PASSENGER RAILWAY.						-
name.	Authorized.		Due	Interest periods.	Bid.	Ankod.	NAME.	Authorized.		Due	Interest periods.	Bid.	Ashq
Albany N. Y.  Date of Quotation—May 28, 1900 the Albany Ry. CoCons. mtg. 58.	\$500,000 750,000	427,500 875,000		J. & J. M. & N.	*1171/2		New Orleans La.  Date of Quotation—May 28, 1900.  Canal & Claiborne RR cons mig. 6s.  Orescent City RR lst mig. 6s.  Orescent City RR lst mig. 6s.  New Orleans City RR lst mig. 6s.	\$150,000 5,000,000	8,000,000	1899 1948	M. & N.	1053/4	112
the Albany Ry. CoGen. mtg. 5s.  Vatervleit Turnpike & RR.1st mtg. 6s.  Vatervleit Turnpike & RR.2d mtg. 6s.  roy City Railway Colst 5s.  fInterest guar. by Albany Ry. Co.  iPrincipal and interest guar. by	850,000 150,000	850,000 150,000	1919	M. & N. M. & N.	*125 *128 *116½	127½ 127	New Orleans City RR	850,000 800,000 800,000	2,599,500 850,000 800,000	1943 1907 1912	J. & J. F. & A. J. & J. J. & D.	108	111
Baltimore Md.  Date of Quotation—May 28, 1900							New York.  Date of Quotation—May 28, 1900.	1,500,000	1,500,000	1984	J. & J.	95	
nited Electric Ry, Colst mtg. g. 4sincome 4s. Saltimore City Pass. Bylst mtg. g. 5s. Baltimore Traction Colst mtg. g. 5s. Baltimore Traction Colst mtg. g. 5s. Bal. Trac. Co. No. Balto div.lst mtg. g. 5s. Bal. Trac. Co. Ooll. Trust, Ist mtg. g. 5s. Baltimore Traction Co. Convertible 5s. Central Pass. Ry. Colst mtg. 6s. Central Pass. Ry. Colst mtg. g. 5s. Lity & Suburban Rylst mtg. g. 5s. Lake Roland Elev.,lst mtg. 5s.	88,000,000 14,000,000 2,000,000 1,500,000 1,250,000 750,000 800,000 96,000 604,000 8,000,000 1,000,000	18,000,000 2,000,000 1,500,000 1,250,000 1,750,000 117,000 580,000 8,000,000 1,000,000	1949 1911 1929 1901 1942 1900 1906 1912 1982 1922	J. & D. M. & N. M. & N. M. & S. J. & D. J. & J. N. & M.	102 74% 1187% 119 104% 121 101 102%  119	102½ 75 120 121½ 121 121 117	Atlantic Av. (Brooklyn). Isigen. mig.5s. †Atlantic Av. (Brooklyn). Cons. mtg. 5s. †Atlantic Av. (Brooklyn). Cons. mtg. 5s. Broadway & 7th Ave. 1st ons. mtg. 5s. Broadway & 7th Ave. 2d mtg. 5s. Broadway & 7th Ave. 2d mtg. 5s. Broadway Surface. 1st mtg. 5s. Broadway Surface. 2d mtg. 5s. Brooklyn City & Newtown. 1st mtg. 5s. Brooklyn City & Newtown. 1st mtg. 5s. Brooklyn, Bath & W. E. RR. Gen. mtg. 5s. Brooklyn, Bath & W. E. RR. Gen. mtg. 5s. Brooklyn, Heights RR. 1st. mtg. 5s. Brooklyn Heights RR. 1st. mtg. 5s. Brooklyn, Q's Co. & Sub'n. 1st mtg. 5s. Brooklyn, Q's Co. & Sub'n. 1st cons. 5s. Brooklyn, Q's Co. & Sub'n. 1st cons. 5s.	795,000 8,000,000 12,500,000 1,500,000 500,000 1,125,000 1,000,000 6,000,000 2,000,000 1,000,000 2,000,000	759,000 1,965,000 7,650,000 1,500,000 500,000 1,125,000 1,000,000 6,000,000 2,000,000 448,000	1909 1981 1948 1904 1914 1924 1905 1941 1989 1988 1941	M. & S, A. & O, J. & D, J. & J, J. & J, J. & J, J. & J, J. & J, J. & J, J. & J,	1071/2 115 128 104 108 115 105 116 116 1115 101 104 112 107	111 112 100 111 110 111 111 111 111
All of the bonds of the above ompanies, marked †, have been assumed by the United Railways & Electic Company.  BOSTON, MASS.  Date of Quotation—May 28, 1900.  Lynn & Boston RR	5,879,000 8,000,000 2,000,000	8,702,000 8,000,000 2,000,000	1902	J. & D. M. & N. M. & S.	114 104½ 112	115 106	Brooklyn Rapid Transit	7,000,000 700,000 1,200,000 250,000 800,000 1,000,000 100,000 000 000 200,000	5,181,000 700,000 1,200,000 250,000 800,000	1945 1900 1902 1922 1908 1982 1914 1914 1910 1915	J. & D. M. & N. J. & J. J. & D. F. & A. F. & A. M. & S. J. & J.	109% 101% 107 125 101 117 102 108 116% 89	10 10 10 12 10 11
†\$1,674,000 in escrow to retire outstanding bonds of absorbed companies.  Charleston S. C.  Date of Quotation—May 28, 1900.							Lex. Ave. & Pav. Ferry RR.1st mtg. g.5s. Metropolitan St Ry Oo. g. m. cl. tr. g.5s. Second Avenue Ry. Gen. cons. mtg. 5s. Second Avenue Ry. Deb. 5s. Steinway Ry. (L. I.)	12,500,000 1,600,000 800,000 1,500,000	12,500,000 1,600 000 300,000 1,500,000 850,000	1997 1909 1909 1922	F. & A. M. & N. J. & J. J. & J.	120 120 1°8% 116 110%	12 10 11 11
Enterprise Street RB	500,000 850,000	47,000		J. & J. J. & J.	106	****	Twenty-third Street Ry	150,000	5,000,000	1987 1909 1906 1942	J. & J. J. & J. J. & J. F. & A	106 118 110	10
Chicago III.  Date of Quotation—May 28, 1900  Ohicago Oity Ry	400,000 1,000,000 7,500,000 1,500,000 4,040,000 7,574,000 15,000,000 8,171,000 500,000 2,500,000 4,100,000 2,700,000	500,000 7,500,000 750,000 4,040,000 8,781,200 15,000,000 500,000 500,000 2,500,000 8,969,000 700,000	1908 1929 1929 1907 1982 1928 1942 1906 1911 1900 1927 1928 1911	F. & A. J. & D. A. & O. J. & J. J. & J. J. & J. J. & J. J. & J. M. & N. J. & N. J. & D.	1013/4  1081/4  96 106  108	2½ 102  109  95%  111 102	Twestchester Electric RRlst mig. 5s.   \$1,085,000 in escrow to retire gen. mig. bonds.   184,850,000 in escrow to retire maturing obligations.   \$562,000 in escrow to retire lst and 2d mig. bonds.   3in treasury, \$80,000.   1 Guar. by Union Ry. Co.   Toronto Canads.   Date of Quotation—May 28, 1900.   Montreal St. Ry	2.500.000	800,000 2,300,000	1908			504
est Chicago St. RR Con. mig. g. 5s. W. Ohicago St. RR. Tunnellstmig. 5s. †Redeemable at option on 60 da. notice. If unded debt assumed by Ohicago W. iv. Ry. Co., controlling interest of high is owned by W. Chicago St. RR. o., lessee. †Bubject to call after Oct. 1, 1899, at 10 and interest.   Lassumed by W. Ohi. RR. Co., lessee.   Int. guar. by W. Ohicago St. RR. Co. Cincinnati, O.		6,000,000 1,500,000		F2% A.	1065/8	107	Philadelphia.  Date of Quotation—May 28, 1900  Continental Pass. By	800,000 100,000 150,000 250,000 500,000 1,125,000 5,698,210 200,000	250,000 458,000 867,000 200,000 1,018,000	1901 1905 1911 1912 1948 1910	J&.		
Date of Quotation—May 28, 1900.  In. New. & Cov. St. By. 1st Con. mtg. g. 5.8  Mt. Adams & Eden P'k In 1st mtg. 6s.  Mt. Adams & Eden P'k In 1st mtg. 6s.  Mt. Adams & Eden P'k In 1st mtg. 6s.  Mt. Adams & Eden P'k In 2st mtg. 6s.  Jo. Oov. & Cin. St. Ry 2d mtg. 6s.  † Assumed by the Cincin. St. Ry. Co.  1\$250,000 reserved to retire 1st mtg. bds.  Cleveland, O.	46,000 100,000 581,090 250,000 400,000	100,000 581,000 250,000	1900 1905 1906 1912	J. & J. A. & O. A. & O. M. & S. M. & S. J. & J.	114 % 108 % 114 108 % 12 i % 182 3 %	115 104  122½ 187	Thirteenth & 15th St. Ry	29,785,000 29,785,000 750,000	500,000 29,724,876	1911 1945 1905 1906	A. & O.		::
Date of Quotation—May 28, 1900.  Brooklyn Street RR. Co1st mig. 6s, fin. New't & Cov. St. Ry. Cons. mig. 5s. leveland City Cable Ry1st. mig. 5s. Cleveland Electric Ry. Co. 1st mig. g. 5s. Cleveland Electric Ry. Co. 1st mig. g. 5s. Slamt Cleveland RR1st mig. 5s. Hast Cleveland RR1st mig. 6s. corain (O.) Street Ry1st mig. 6s. 5st. Ry. Co., Grand Rapids1st mig. 5s. 41, 900,000 in escrow to retire bonds of bsorbed companies, marked a.  Interest guar. by Cons. St. Ry. Co.  Detroit, Mich.	8,000,000 2,000,000 8,500,000 1,500,000 600,000 200,000 800,000	2,500,000 2,000,000 1,249,000 1,500,000 1,000,000	1922 1909 1918 1918 1910 1922 1915	M. & S. M. & N.	106½ 118½ 105½ 106	107 114% 106 107 	Date of Quotation—May 28 1900  Birmingham, Knox & Allentown	1,250,000 1,250,000 1,500,000 50,000 1,250,000 750,000 1,500,000 1,500,000 1,500,000	875,000 1,250,000 1,500,000 50,000 1,250,000 250,000 750,000 1,500,000 1,500,000 1,400,000	1980 1927 1980 1918 1942 1928 1924 1927 1929 1922 1980	M. & S. J. & J. A. & O. J. & J. J. & J. M. & N. J. & J. A. & O. M. & N. J. & J. A. & O. J. & J. M. & N. J. & J. M. & S. J. & J. M. & S. J. & J. M. & S. J. & J. M. & S. J. & J. M. & J. J. & J. M. & J. J. & J. M. & J. J. & J. M. & J. J. & J. M. & J. J. & J. M. & J. J. & J. M. & J. J. & J. M. & J. J. & J. J. & J. M. & J. J. & J. M. & J. J. & J. &	1111/4	118
Date of Quotation—May 28, 1800.  Detroit Citisens St. Ry	1,800,000	8,885,000 877,000 1,800,000	1902	A. & O.	105	1021/4	Providence R. I.	50,000	50,000 8,260,000			116	ïi
Date of Quotation—May 28 1(00, iew Haven 8t, Rylst mig. g. 5s. iew Haven (Edgewood Div.)lst.mig.5s. Yinhester Avenue RR—lst mig. g. 5s. Yinhester Avenue RRDeben g. 5s.	600,000 250,000 100,000 100,000		1914 1912	M&S J&D M&N M&S	111 111 109		Date of Quotation—May 28, 1900, Baden & St. Louis RR	250.090 1,813,000 2,000,000 1 660 800	250,000 1,813,000 1,800,000 000 000	1912 1907	J&J	101% 101% 109	10 10 10 11

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PASSER	iger i	RAILW	AY	,		
	Ame			Interest		A-N-4
TAKE.	Authorized.	Issued.	Due	periods.	Bid.	Asked
St. Lows.						
Date of Quotation—May 28, 1500, Jefferson Avenue Bylst mig. 5s.	400,000	400,000	1905	M. & N.	108	105
Lindell Ry. Colst mtg. 5s Missouri RB. Co		1,500,000	1911	F. & A.	108 105	109 106
tMound City RR. Colst mtg. 6s. People's RR. Colst mtg. 6s.	400,000	800,000 125,000	1910 1902	A. & O.	100	102
People's RR. Co	75,000	75.000 800,000	1902 1904	M. & N.		******
St. Louis & E. St. L. Electriclst mtg. 6.		75,000 2,000,000	1905 1900	J. & J.	100	101 100 ×
St. Louis RR. Colst mtg. 5s. 18t. Louis & Sub. Rylst mtg. 5s. 18t. Louis & Sub. Rylst mtg. 5s.	2,000,000 800,000	1,400,000 800,000	1921		108	104
St. Louis & Sub. ByIncome 5s. ††Southern Electric ByCons. mtg. 6s. ¶Taylor Avenue St. Bylst mtg. g. 6s.	500,000 500,000	500,000 500,000	1909 1918		106 116	108 118
Union Depot BR. CoSt cons. mtg. 6s. Union Depot BR. CoCons. mtg. 6s.	1,091,000 8,500,000	1,091,000	1900 1918	A. & O.	100 121	100½ 122
†Controlled by St. Louis RR. Co.	-,,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				
Controlled by Union Depot RR. Co.	i					
\$200,000 in escrow to retire 1st & 2d mig.						
##\$200,000 in escrow to retire 1st mig.						
San Francisco Cal.	1					
Date of Quotation—May, 1900. California St. Cable RBlst mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
† Ferries & Cliff House Rylst mtg. 6s. Geary St., Park & Ocean BBlst. mtg. 5s.	650,000	650,000 671,000	1914 1921	M. & S.	•••••	117 ; 95
Market St. Cable Ry. Colat mtg. g. 6s. † Metropolitan Ry. Colst mtg.	8,000,000	8,000,000	1918	J. & J.	126).	
Omnibus Cable Colst mtg. 6s.	2,000,000 850,000	2,000,000 850,000	1918 1912		126 % 105 %	107
Park & Ocean BR	250,000	250 000 700,000	1914 1912	J. & J.	115	125
†Powell St. Rylst mtg. 6s. Sutter St. Ry. Colst mtg. g. 5s. †Controlled by Market St. Ry. Co.	1,000,000	900,000		M. & N.		•
Washington D. C.						
Date of Quotation—May 28, 1900 Belt By. CoCons mtg 5s.	500,000	450,000	1920	J. & J.		
Columbia By's mig. 6s. Eckington & Soldiers' Home, 'c' mig. 6s.	500,000 200,000	500,000 200,000	1914 1911	A. & U.	183	
Metropolitan RR. CoColl. tr. cons. 6s.	500,000	500,000	1901			•••••
†\$50,000 in escrow to retire lat mig.bds. Miscellaneous.						
Date of Quotation—May 28, 1900.  Bridgeport Traction Co1st mtg. 5s.	0.000	1 499 000	1000			
Buffalo (N. Y.) By. CoCons. mtg. 5s. ('tizens' St. B. (Ind'polis).1st cons.m.5s	2,000,000 5,000,000	1,688,000 8,548,000 8,000,000	1981		108 118	110
Orosstown St. Ry. (Buffalo)lst. mtg.5s. Columbus (O.) St. Rylst cons. g. 5s.	8,000,000	2,866,000 2,261,000	1982	M. & N.	104 112	105 118
Consolidated Traction (N. J.)lst mtg.5s	8,000,000 15,000,000	18,965,000 572,000	1988	J. & D.	1115	111%
Crosst'n St. Ry. (Colu's, O.)lst mtg.g.5s Denver City Cable Rylst mtg. g. 6s. Denver Con. Tram'y CoCon. m. g. 5s.	2,000,000 4,000,000	8,800,000 922,000	1920	J. & D. J. & J.	115 20	1165
Louisville (Ky.) Rylst cons. mtg. g.5s. Minneapolis St. Rylst cons. mtg. g.5s.	4,000,000 6,000,000	4,981,000 4,050,000	1930	A. & O. J. & J.	80 119	85 11914
†No. Hudson Co. Ry. (N.J.). Cons. mtg. 5s. No. Hudson Co. Ry. (N.J.)2d mtg. 5s. No. Hudson Co. Ry. (N.J.)Deb. 6s.	5,000,000 8,000,000	2,878,000 550,000	1928	J. & J. J. & J.	110¼ 108	110%
No. Hudson Co. Ry. (N. J.) Deb. 6s.	550,000	489,000	1902	F. & A.	:	•••••
Paterson (N. J.) ByCons. mtg. g. 6s. Wochester (N. Y.) Bylst mtg. 5s. St. Paul City RyCons. g. 5s.	1,250,000 8,000,000	1,000,000 2,000,000	1980	J. & D. A. & O.		•••••
St. Paul Oity By	5,500,000 1,000,000	4,298,000 1,000,000	1900	•••••	105% 108	106
†\$1,000,000 in escrow to retire 1st and d mtg. bds.						
13800,000 in treasury. Bonds guar. by Buffalo Ry. Co.					i (	
18760,000 in escrow to retire bonds of . C. St. BR. Co.						
\$87,000 in treasury. \$960,000 res'ved to redeem prior liens.						
78620,000 in escrow.					*With	nt'rest
ELECTRIC LIGHT AN	D ELE	OTRIC	AL			08,
Boston, Mass.						
Date of Quotation—May 28, 1900.  Delaware Gas Lt. Co.,1st m. 5s, g.	800,000	800,000		J. & J.	106	103
Edison Elec. Illuminating Co., Boston General Electric Cogold coup, deb. 5s	2,026,000 10,000,000	8,750,000	1922	Quar.	157 116	****
Pittsburg Pa	10,000,000	0,100,000				
Date of Quotation—May 28, 1900 Allegheny County Light Co	500,000		1911	J. & J.	110	
Westinghouse Elec. & M(g. Co. Scrip 6s.	195,570	•••••		M. & S.	••••	*****
Miscellaneous.—(May 28, 1900.)	4,812,000	4,812,000	1910		109	•••••
E lison El. Illg. Co. (N. York) lst m. 5s E lison El. Illg. Co. (N. Y.) con. m. g. 5s. E lison Elec. Illg. Co. (Brooklyn)	15,000,000 5,000,000	2,188,000	1998 1940	•••••	124 1274	124
E lison Electric Light (Philadelphia) Kings Co. El. Lt. & Pow. Co.lst mtg. 5s.	2,000,000 2,500,000	2,500,00	1987	A. & O.	100	103
Kings Co. El. Lt. & Po. Co. pur. money 6s. Milwaukee El. Ry & Lt. Co.1st con. g. 5s.	5,176,000 8,000,000	5,176,00 6,133,0	1997	A & O. F. & A.	120 102}	122
Inited Elec. Light & Power Co(N. Y.)	5,000,000		••••			••••
TELEPHONE	AND T	TELEG	R	APH.	<del></del>	
Miscellaneous.  Sate of Quotation—May 28 . 1900.			ļ		100%	101
American Bell Telephone43. Northwestern Telegraph Co			1908	F. & A.		••••
Northwestern Telegraph Co	•••••	•••••	1911	J. & D.	114 108	115 106
ALLIED	<del></del>					
Miscellaneous.	1					
Date of Quotation-May 28, 1100						
American Electric Heating7s. Armington & Sims Engine Co	500,000	500,000	••••	********	••••	25
Barney & Smith Car Co	*******	•••••	1942 1904	J. & J J & D.	106	107
Worthington Pump Co †Nomina	75,000   1.	********	······	••••••	115	127
•						

# NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 161@161c.; Lake, 161@161c.; casting, 161@161c.

The employes of the United Electric and Power Company of Baltimore, Md., have struck for higher wages.

A fluxucial paper states that the impression continues strong that the Metropolitan's \$7,000,000 stock issue will be taken by insiders at a high figure.

The president of the Electric Vehicle Company states that there is no likelihood of acceptance of the proposition to unite with the Anglo American Vehicle Company.

The Sawyer Electrical Company of Philadelphia, Pa., has made an assignment for the benefit of creditors to Alfred H. Faber. The deed is dated April 26 last and conveys no real estate.

A certificate of merger of the Kings County Elevated Bailroad Company with the Brooklyn Union Elevated Bailroad Company was filed with the Secretary of State at Albany on the 24 h inst. The action is purely formal.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 19@21; New York Electric Vehicle Transportation, 8@81, New England Transportation, 4@41; Gramophone, 40@45.

An alliance for legal protection is said to have been entered into by the National Gramophone Corporation, the Universal Talking Machine Company, the American Graphophone Company and the Columbia Phonograph Company.

The Elmira Water & Light Company of Elmira. N. Y., with a capital stock of \$1,000,000, filed papers of incorporation with the Secretary of State at Albany last week. The company purposes to generate and distribute electricity.

It is said that an application will be made immediately in the Supreme Court by Brooklyn, N. Y., organizations for an order to enforce single fare law and so prevent the Brooklyn Bapid Transit Company from doubling Coney Island fares.

The United Traction Company of Albany, N. Y. (operating Albany and Troy surface roads), reports for the quarter ending March 31: Gross, \$299.047; net, \$91,-469; other income, \$1,002; total income, \$92,471; fixed charges, \$58,654, surplus, \$33,817.

The stockholders of the Amherst & Sunderland Street Railway Company of Amherst, Mass., have voted to authorize the directors to issue additional stock to the amount authorized under the charter, namely \$50,000, for building a new power plant and for an extension of the line to Sunderland.

The Hope Electric Appliance Company of Lewiston, Me., has increased the capital stock of the corporation from 10,000 shares of \$100,000 par value to \$500,000. Of this 25,000 shares are preferred stock entitled to cumulative dividends of 7 per cent. The number of directors is increased from three to five.

Advices from Cincinnati state that the Southern Ohio Traction Company, operating between Dayton and Cincinnati, has filed a mortgage to cover \$2,000,000 tweny year five per cent. bonds. The issue will be used to redeem \$1,300,000 existing liens and the rest for improvements.

The Directors of The London & River Plate Bank, Limited, London, have declared an interim dividend of eight per cent. forsix months. As will be seen by the card on another page of ELECTRICITY, this bank has established branches in the following cities: Para, Pernambuco, Rio Janeiro, Santos and Sao Paulo in Brazil: Buenos Aires. Roeario, Babia Blanca and Mendoza in the Argentine Republic: Montevideo and Paysandu in Uruguay.

The Massachusetts Electric Companies is offering to exchange its stock for that of the Lowell & Suburban on the basis of 2 shares of preferred and 1½ shares of common stock for each share of Lowell & Suburban. At the time of the organization of the Massachusetts Electric Company it was unable to secure a control of the Lowell & Suburban, and a proposition was made to lease it on a basis of 7 per cent. for 5 years and 8 per cent. for 20 years. It is understood that a majority of the stockholders are favorable to the acceptance of the proposition.

At the annual meeting of the Kensington Electric Light Company, held on May 23 at the company's offices in Philadelphia, Pa., the following officers were elected. President, William McIutyre, vice-president, Nathan Pollock; secretary, E T. Wilkenson; treasurer, W. C. Bird; directors: J. B. Harbison, F. S. Christian and Nathan Pollock. The report for the fiscal year showed that the receipts amounted to \$130,228 30, while the payments were \$105,309 30, leaving a cash balance of \$24,919. A divider d of \$1 per share, amounting to \$12,721.25, was paid before the cash balance was struck fore the cash balance was struck.

The balance sheet of the Kings County Electric Light & Power Company, as of May 1, shows: Assets—Property and construction account, \$3,143,261; Central Trust Company of New York, trustee, \$1 000,000; stock in other companies, \$5 175,770; discount, \$100,000; bills receivable, \$175,000; general accounts receivable, \$950; cash on hand and in bank, \$64,044; total, \$9.659,025. Liabilities—Capital stock, \$1,950,000; first mortgage 5 per cent. gold bonds, \$2,500,000; purchase money, 6 per cent. gold bonds, \$5,175,900; profit and loss account, \$25,474; accounts payable, \$7,651; total, \$9.659,025. \$7,651; total, \$9,659,625.

The Elm Street Connecting Railway Company filed articles of incorporation in The Elm Street connecting Railway Company fled articles of incorporation in the Secretary of State's office at Albany last week. The capital stock is \$20,000. The incorporators are recognized as being connected in various ways with the Metropolitan Street Railway Company of New York City. Charles E. Warren subscribes for the greater part of the capital stock. It is understood when the rights are secured for this company that the railroad will serve as a very valuable feeder to the Metropolitan system. It will be used in connection with a line to be built on Lafayette Place for which the Bleecker Street and Fulton Ferry Railroad Company has rights. has rights.

The market for copper has been gradually tending to a lower level, says the The market for copper has been gradually tending to a lower level, says the Boston "News Bureau." Sub-rosa terms considerably below published official quotations have been possible for some little time but consumers and exporters have adopted an exceedingly conservative policy and as a consequence sales have been difficult to effect. Meanwhile values have been settling and have reached the level of about 16½c, with more sellers than buyers. Business is heard of at figures inside of prices popularly quoted, but the quantity was not large, and the brand other than lake. The feeling is that the market will have to become more settled before activity can be expected. tivity can be expected.

On May 24 Hugh J. Grant, receiver of the Third Avenue Railroad Company, turned over his charge to President Vreeland of the Metropolitan Street Railway Company. In doing so he said: "In pursuance of the order of the Court, granted on May 23, vacating the interlocutory order and discharging the receiver, and having received your affidavit that you have deposited the sum of \$23,000,000 with the Morton Trust Company, I now formally resign the Third Avenue Railroad to you" Before the formal transfer was made, Kuhn, Loeb & Co., had paid the Morton Trust Company for the \$35,000,000 of honds issued by the Third Avenue Company. The Trust Company will pay claims against the Third Avenue road as soon as they are audited by the Secretary of the Metropolitan Street Railway Company and the treasurer of the Third Avenue Company.

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# **PLECTRICITY**

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# EDITORIAL NOTES.

The Behr Mono-Rail Electric Railway Scheme.

In view of the interest that is being taken in this country in rapid transit, a few words in reference to the discussion that is going on in England, re-

garding the connecting of Manchester with Liverpool by means of the Behr mono-rail electric railway, should prove interesting.

This railway, as stated in the issue of ELEC-TRICITY of March 29, 1899, is the invention of Mr. F. Behr, an Englishman. As the name indicates, the cars run on a single rail, elevated several feet above the ground, supported on A-shaped steel trestles. The cars, which have a seating capacity of 100, are double-deckers about 60 feet in length and equipped with four motors. To sustain the car in an upright position as well as to prevent derailment, a number of horizontal guide wheels are provided which run upon specially devised guide rails. In this system no overhead conductor is made use of, the current being delivered along the line by means of a third rail which rests upon the trestles, but which is insulated from them.

With this explanation of the system, the following discussion which recently took place before a Parliamentary Committee sitting in London, appointed to examine into the question and for which we are indebted to our London correspondent, will readily be under-Mr. Behr, in appearing before the committee, quoted the result of his Brussels experiment [see Electricity March 29, 1899] where, in spite of curves, a speed of 83 miles an hour was obtained, a proof that "given a properly constructed line and stations, there is no difficulty in increasing speed to 110 or 120 miles an hour." Mr. Behr was so confident that he offered a \$500,000 deposit as a guarantee of his ability to do what he said. M. Gérard, who is engineer-in-chief to the Belgian State Railway, and president of the Belgian Society of Electricians, and who had investigated the Brussels line for the Belgian Government, was convinced that on the Manchester-Liverpool line a speed of 100 to 110 miles could be easily attained and maintained. Sir William Preece in evidence said that the generating station for the system would be built at Warrington, nearly the center of the line. Threephase currents will be distributed to sub-stations at intervals of three or four miles. It

would there be transformed down from 10,000 to 1,000 volts. Sir William Preece is of deliberate opinion that the whole scheme is engineeringly and commercially sound. A ten minute's service is proposed for most of the day, and a fifteen minute's service during the other portion. The train mileage is set down at 1,500,000 per annum, and 7½ units would be consumed per car mile. The total cost of haulage is put at below 14 cents per car mile against 16 and 20 on steam lines. The working expenses will be roughly \$375,000 per annum.

The question of brake power is at present in the experimental stage. What is to be feared is the generation of heat.

Mr. Cottrell, the engineer of the Liverpool Overhead Railway, thought the scheme feasible, but questioned the speed of 110 miles. If a train had to be stopped within 500 yards, great inconvenience to passengers must be caused. It could be done comfortably within 900 yards by short-circuiting the motors. Mr. Parshall and Dr. Edward Hopkinson also supported the proposal.

There are to be no intermediate stations between Liverpool and Manchester. The scheme is promoted largely by business men of the two cities, men who recognize the need for a better service than now exists. The capital of the company is \$10,000,000 with \$3,360,000 in debentures. The cost of construction works out at \$8,750,000.

A Combination Telephone and Phonograph.

During the past few years various electrical devices have been brought out with a view to recording a message or speech in the ab-

sence of the party to whom the message is being sent. Prof. Grey's telautograph regarding which so much was heard a few years ago, was primarily intended to accomplish this purpose, as was neidentally the several pictures or recording machines, such as the telepantograph, the telediagraph and others. With the exception of the telautograph, the devices mentioned equire considerable manipulation before a message can be recorded, and probably for this reason they have not as yet come into extensive use, although they have been employed to a certain extent for transmitting pictures and like nesses over considerable distances.

With a view of simplifying the apparatus, a Danish engineer by the name of Paulsen has hit upon the plan of combining a telephone and phonograph for this purpose, which is



simple in operation, and which is said to give excellent results. This ingenious instrument was referred to several months ago in Elec-TRICITY, but at that time the details of its operation had not been made known. present, however, the device is on exhibition at the Paris Exposition, and its modus operandi has been explained. As previously stated, the so-called telegraphone is a sort of combination of telephone and phonograph, capable of being used either as a registering telephone or as a phonograph of a much more perfect type than any now in use. The phonograph differs materially from that invented by Edison, in that the wax cylinder is done away with. The principle of its operation is explained in a recent issue of the London "Electrical Review" as follows:

"The principal difference between the ordinary phonograph and the telegraphone consists in the fact, that in the latter instrument the 'phonetic writing' of the sound waves is not performed mechanically, but only magnetically by means of an electro-magnet, the moving basis being made of steel or nickel instead of wax or similar substance. To explain the action: Suppose the electro-magnet to be magnetized by telephone currents, while say a steel band passes just close along its poles, the surface of the steel will be permanently magnetized more or less strongly, corresponding to the varying magnetism of the electro-magnet, viz., to the telephonic currents. On reversing the action by again letting the steel band, 'prepared 'as above-in proper direction-be moved quickly in front of the poles of the same or another electro-magnet, whose windings now are to be connected to a telephone. varying currents due to the different magnetization of the steel band are induced in the said windings, causing the telephone to repeat exactly the sounds once fixed upon the telegraphone as often as is desired."

Referring to the details of its toperation the above quoted paper says:

"A very small electro-magnet, say some few millimeters long, is sufficient as well for 'writing' as for 'reading.' Instead of a steel band, it has in some instances been found more practical to use a pianoforte wire wound screwthreadlike in grooves upon a horizontal drum rotated, for instance, by a small electro-motor, while the 'writing' or 'reading' electro-magnet is shifted along a metallic rod parallel to the axis of the apparatus by means of the screw-laid windings themselves. When all the wire has been 'used,' the electro-magnet is automatically detached, and quickly brought back to its starting position by a special arrangement."

It is further stated that another engineer by the name of Peterson has invented a method by means of which several different speeches may be recorded upon the telegraphone and reproduced at will separate and distinct.

Numerous trials have shown that the telegraphone can be made to reproduce speech as genuine and free from secondary sound as the telephone itself, and as our contemporary states in comparison with the phonograph, it has the advantage that the phonetic writing, although not to be wiped out in a mechanical way, may be very easily obliterated by sliding a rather strong magnet (or magnetized electromagnet) along the surface of the steel basis; indeed, whenever this is done, every trace of the writing is done away with and the instrument is once more fit for receiving new impressions.

That there is a demand in the commercial world for an instrument of this nature there is little doubt, as it would enable orders or messages to be received and preserved until wanted. Like all innovations, however, it will probably make but slow progress at first, so that it may be several years before the office boy can be dispensed with.

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## High Tension Electrical Effects.

Of late high-tension electrical effects are coming more and more into vogue for advertising and exhibition purposes. This

is probably owing to the fact that ordinary electric illumination having become a necessity, no longer attracts and rivets the attention of the public as it was wont to do some years ago. There is also a certain amount of attractiveness to most people on high voltages, due presumably to an imaginative element of danger. It is for these reasons that scarcely an exhibition of any kind takes place, but what one of its principal features of attraction is a high tension electrical display, arranged either so as to form the letters of a word or as a simple spark discharge. In this respect the Exposition now going on in Paris was no exception to the rule, and arrangements were early made to decorate the facade of the Palace of Electricity with a worthy display of this nature.

The electrical plant to produce the desired effects was designed and constructed under the supervision of M. D'Arsonval, and embodies several novel features, which are described in a foreign contemporary. For the purpose in view it was necessary to be able to obtain at will either short or long sparks, which had moreover to be very brilliant or very noisy. The desired end was attained by the discharge of very powerful condensers charged to a high potential by an alternating current transformer. The latter is of 30 kw. capacity, and the alternator to which it is connected has a periodicity of 42 cycles per second. The primary of the transformer consists of two sections, which can be coupled either in parallel or in series. The high tension circuit can be relied on to work up to 90,000 volts for prolonged periods, or to even higher voltages, so it is claimed, for a shorter length of time.

The condenser is said to have given much trouble at the outset, since when glass was used as the insulator even in a thickness of 5 millimeters (.196 in.), it was invariably pierced by the sparks, while ebonite, celluloid and paraffined paper proved equally ineffective.

Finally, however, micanite was adopted, and has resisted satisfactorily. The condenser has been built up of alternate layers of very thin tin-plates and sheets of micanite 2 millimeters (.079 in.) thick, 365 millimeters (14.37 in.) in length, and 285 millimeters (11.22 in.) in breadth. There are twenty such layers, the capacity of each being about one-hundredth of one microfarad.

These condensers have given entire satisfaction. They do not heat, and being immersed in paraffine lose nothing by brush discharges. The spark is passed between two balls, the formation of a permanent arc being prevented by a blast of air or by the device due to M. D'Arsonval, of causing the balls to rotate by means of a small motor, the rush of air being then sufficient to prevent the formation of an arc.

Those who have witnessed the display with this arrangement assert that it is very striking. The length of spark obtained with the condensers charged to 50,000 volts, is 18 to 20 centimeters (7.08 in. to 7.87 in.), but by suitably adjusting the speed of rotation of the two balls, the apparent length can be greatly increased, owing to the persistence of the vision, and in this way sparks appearing to be nearly 12 meters in length, have, so it is asserted, been obtained

Altogether, the arrangement for a high tension display, devised by M. D'Arsonval, is most ingenious, and it remains to be seen whether it will be surpassed in point of spectacular effect by anything of a similar nature at the Pan-American Exposition.

# UNDER THE SEARCHLIGHT.

# Notes and Comments on Várious Topics.

THE War Department recently awarded a contract to the Safety Wire and Insulating Company of this city for the construction of 500 miles of cable to be used in the Philippines The contract price is \$330 per mile. The company agrees to have the cable ready by September 1.

THE water supply of Brooklyn is so low, it is stated, that the residents of that borough will be compelled to forego seeing for the rest of the season the gorgeous display of light and color made by the electric fountain at the Prospect Park Plaza. If water is at a premium, why not alter the existing fountain to an illuminated one without water, such as exists in the Spanish section of the Paris Exposition, and which was described recently in Electricity.

To prevent loss of electrical power by leaky rail joints the Grand Rapids (Mich.) Railway Company will weld the joints on all new construction. An apparatus for this work is being built by the company, and when completed will be moved about as a furnace on wheels.

At a recent meeting of the Central Federated Union in this city a letter was read from Col. Kipp, Chief Clerk of the Police Department, stating that the law requires an engineer's license for every one operating a boiler which carries more than ten pounds of steam. "Steam automobiles," he said, "carry about 225 pounds and therefore come under the operation of this law." The owners of automobiles of which electricity is the propelling power are safe from the police, as the law deals only with vehicles of which steam is the motive power.

QUOTING from a German publication, the London "Electrical Engineer" states that the heat generated by an ordinary incandescent lamp is greatly underestimated by the general public. Experiments have proved that a small incandescent lamp placed in a vessel containing half a liter of water will heat the latter up to boiling point within less than an hour. An incandescent lamp placed in contact with celluloid will ignite the same in five minutes. It is also very dangerous to place incandescent lamps in the proximity of cotton wool, for after a very few minutes the wool is scorched and ignited. Silk is less inflammable, but even this is scorched at a distance of 3.9 inches in from eight to ten hours.

BRIGADIER GENERAL GREELY is reported to have directed the establishment of wireless telegraphy stations in the harbor of San Francisco and in Porto Rico and the Philippines.



In New York harbor it is possible that the wireless telegraph system may take the place of the cable connecting Fort Hamilton and Fort Hancock. This cable was recently found to be cut in eleven places. It is desired to connect the various points in San Francisco harbor at which guns are located. Wireless telegraphy, it is believed, will give better results than a cable. In Porto Rico, Crab Island will be connected with some port on the coast of the larger island, but the establishment of the stations there is merely in order to give officers of the army an opportunity to learn how to operate the system. In the Philippines the system will take the place of the heliograph, which now flashes messages between Corregidor Island and Manila, Bohol and Cebu, and other points.

THE time limit for the placing of fenders on Camden (N. J.) trolley cars under an ordinance recently passed by the City Council expires on June 29. A resolution has been adopted instructing the Mayor and chief of police to stop the running of all cars not equipped with fenders after that date. The street committee prior to the meeting of City Council rescinded their action in approving a wheel guard for the trolley cars and insisting on the use of

NEWS from Milwaukee, Wis, states that an iron mast 150 feet high is soon to be erected at South Point, from the top of which experiments in wireless telegraphy will be made. Messages will be sent and received between South Point and North Point Lighthouse and South Point and Racine Lighthouse, and then experiments of sending and receiving messages to and from vessels under full headway in the lake will be made. The experiments will be made for the benefit of the company owning the patents, and will be conducted by Lee De Forest, a graduate of the Yale Scientific School, and Charles E. Fortier, of the Jonson Electric Service Company.

Some interesting experiments, it appears, are at present being conducted in Budapest, Hungary, with high-pressure rotary current for working an electric railway. It is stated that, despite the high working pressure of 3,000 volts which is used, the system ensures complete safety even in its application to mainline working. Experimentally, the system is to be introduced on to the Valtelina stretch of the Italian State Railways, which has a length of almost 66 miles. The length of the cars which are worked by the new system amounts to 60 feet, while the speed attained is about 37 miles per hour.

The newest, and probably the best equipped electrically, of the world's fleet of cableships is the Von Podbielski, which has just been finished on the Clyde. She was built for a Cologne, Germany, firm of cablemakers and layers and is 255 feet long between perpendiculars and has a moulded breadth of 35 feet. When fitted out for sea her dead weight carrying capacity will be about 1,300 tons. She has three cable tanks and her main deck is flush from stem to stern to facilitate handling the

# The Municipal Electricians.

Arrangements have been made for the next annual convention of the International Association of Municipal Electricians to be held at Pittsburg, Pa., September 25, 26 and 27. It is expected that 200 cities and towns will be represented. Papers on the following subjects will be read: By Capt. William Brophy, "Benefits to be Derived from Our Association;" Frank C. Mason, superintendent of Brooklyn police telegraph, "Contact Points;" M. G. Canfield, Grand Rapids, Mich., "Trials and Troubles of Instituting and Enforcing Municipal Inspection and Control; "Charles Burger, of Boston. "Automatic Fire Alarm Systems." The subject "Advantages and Disadvantages of Carrying High and Low Potential Wires Upon the Same Poles," has not yet been assigned. Two sessions will be held daily. Supt. Mead, who is chairman of the executive committee, is arranging for hotel rates, etc.

## Arranging for the Independent Telephone Convention.

The Independent Telephone Association of the United States meets in Cleveland, O., on June 12, 13 and 14, and arrangements are being made on an extensive and elaborate scale for the accommodation of delegates and their friends. Among other things in the entertainment line will be excursions and a banquet, which may be enjoyed by all visitors free of charge.

The Passenger Associations, covering the entire territory of the United States, have granted a special rate of one and one-third fare the round trip to this Convention. Tickets will be sold on the certificate plan, the purchaser paying full fare going, and upon the presentation of the certificate, which he should procure from the railroad agent at the time he purchases his ticket, he will be granted one-third fare for his return trip. All visitors should arrange with their agent a few days before starting for this rate. Reduced hotel rates will be given in the city of Cleveland. Upon application to C. W. Wason, Electric Building, Cleveland, rooms will be reserved at the hotels.

All persons desiring tickets to the entertainments should make application therefor to the President, James M. Thomas, Room 713, Electric Building, Cleveland, prior to June 12.

The next issue of Electricity will contain the full programme of the Convention.

# Northwestern Electrical Association Convention.

The summer convention of the Northwestern Electrical Association will be held at "Chain of Lakes," Waupaca, Wis., on Tuesday. Wednesday, Thursday, June 26, 27 and 28.

The following papers will be read: "Wet Steam," by W. H. Edgar, of Illinois; "Advantages of Recording Wattmeters on Switchboards," by W. Worth Bean, of Michigan; "Storage Batteries for Small Central Stations," by Louis A. Ferguson, of Illinois-and other papers not announced.

Tuesday afternoon there will be a business session, paper and discussion.

Tuesday evening, grand excursion on lakes in special steamers.

Wednesday morning, business session, paper and discussion.

Wednesday afternoon, "Olympian Games" for handsome prizes.

Wednesday evening, invitation performance by the "Northwestern Minstrels," at Opera House, Waupaca, terminating with a summer night ball,

Thursday morning, business session, paper and discussion.

Thursday afternoon, tub races, swimming matches, boat races, etc.

## SURFACE ELECTRO-MAGNETIC TRAC-TION SYSTEMS.

#### BY FRANK C. PERKINS.

There is no question but that there is a great field for a system of electric traction, in which the overhead trolley is found unnecessary. Many systems have been devised for doing away with the trolley, using both open and closed conduits with varying success. The

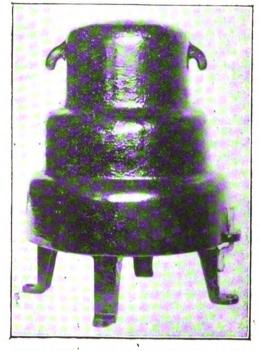


FIG. 1.—100 AMPERE ELECTRO-MAGNETIC SWITCH.

system here described and illustrated is certainly of great interest and has many features which appeal to practical railway engineers.

The "surface contact" or "electro-magnetic "traction system employs surface contacts entirely, the connection between the cars and main feeders being accomplished by electro-magnetic switches, illustrated in Figs. 1 and 2. These particular switches are designed for 100 and 300 amperes, and consist of three

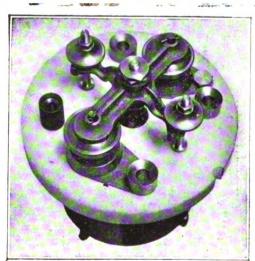


Fig. 2.—300 Ampere Electro-Magnetic SWITCH.

parts, the bell, the pan and the electro-mag netic switching mechanism. These switches are enclosed in moisture proof iron cases, and are each connected on one contact permanently with the positive main or feeder, which is located parallel with the track.

There are cast-iron contact plates or buttons,

two in each group placed between the rails, and electrically connected to the switches. These contact plates may be plainly seen in Fig. 3, which is a view of the track at Indian Head, Maryland, where the system is in operation in the Naval Proving grounds of the United States Government.

A separate switch is employed for each group of buttons. The conductor forming the positive main or feeder is completely enclosed in wrought iron pipe, as will be noted in same view, and is connected to the various switches.

Under each electric locomotive or car is suspended metal contact shoes or bars, as indicated in Fig. 4, which shows a 100 hp. motor car which has been used for several years at the yards of the Westinghouse works where the system is in operation, and forms a junction with the Pennsylvania Railroad tracks. Two bars are suspended to the trucks and a small storage battery is carried on the car, which is required to lift the first switch, and after that has been closed, the contact shoes bridge the main voltage over from one set of pins to another, thus closing the successive switches without further attention from the motorman. The battery is kept charged from the main line by closing certain switches by the motor-

It is claimed for this system that for street railway work it possesses all the advantages of the overhead trolley as well as the underground open conduit systems, while avoiding the disadvantages. It is said the switch boxes are preferably installed outside the track, while the buttons are placed between the rails and mounted on a light metal tie. For double

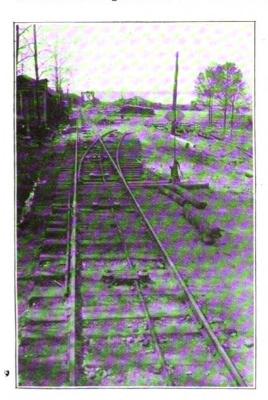


Fig. 3.—ELECTRO-MAGNETIC RAILWAY AT INDIAN HEAD, MD.

track work the switches are placed between the two tracks and the boxes may be built to hold two switches, one for each track.

In some cases but one row of contact buttons is used instead of two. When so arranged it is necessary that the "pick up" current should be of the same voltage as that of the main circuit.

There is no question that a perfectly controlled, economical and simple electro-mag-

netic traction system has many advantages well worth considering. As no poles or overhead wires are necessary, the streets, yards and buildings are left free from all obstructions.

In buildings, manufacturing plants and yards,

ously affected the power delivered by the engines, requiring, too, an abnormal consumption of fuel. In fact, I believe it would actually have required less fuel to produce the results if the exhaust had been turned out of doors and the heating mains connected direct to

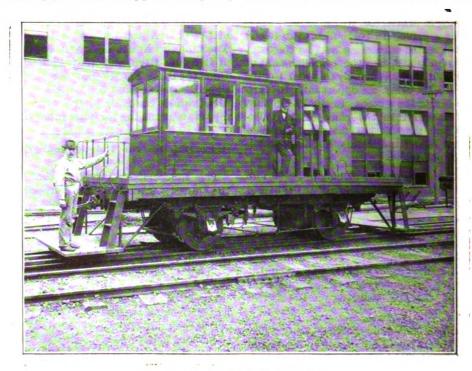


Fig. 4.-100 HP. Motor Car.

freight cars can be handled in either direction without the difficulty of turning the trolley.

It is said the cost is only about one-half that of cable or open conduit system, as there are no deep excavations to be made and can be installed on any road already in operation without tearing up the ties. It is also claimed that the system is perfectly safe, it being impossible for any one on the street to receive a shock.

# UTILIZATION OF EXHAUST STEAM FOR HEATING.\*

BY HARRY J. FRITH, Watseka, Ill

# (Concluded from page 327.)

What is an ideal system? Perhaps the best way to determine this will be to take up the various ways and means of central station heating and consider the advantages and disadvantages of the features that will help in the selection of an ideal system.

The exhaust steam from engines may be used as in the ordinary exhaust-steam heating system. In this case it is delivered direct into the mains, and driven to the points of consumption at a greater or less expenditure of power. To drive this steam, and to increase the temperature in cold weather, it is necessary to carry a back pressure against the engines furnishing the exhaust. Some time since, while investigating the heating question, I found that one station carried a maximum back pressure of seventeen pounds, another of eighteen, another twenty; about half of the ordinary m.e.p of a simple engine working at maximum efficiency. In another case I found that the maximum back pressure was thirty-eight pounds, which equals the usual m.e.p. In this latter case all the engines were high-speed, simple engines, and such a back pressure seri-

\*Paper read at the Twenty-third Convention of the National Electric Light Association, Chicago, Ill., May 22, 1900.

separate boilers. I observed at another time a back pressure of four pounds, with the outside temperature at sixty-three degrees. At the same time a hot-water plant was producing more satisfactory results to its patrons with water leaving the station at 130 degrees Fahrenheit, and returning at 115 degrees Fahrenheit, requiring an expenditure of less power to circulate the water than would be represented by less than one-half pound of back pressure; and there was actually no back pressure other than that which occurs in all engines, due to resistance of parts and exhaust pipes. Clearly, back pressure, even in a small amount, must be avoided, as it is more expensive than equal boiler pressure; for if the point of admission remains fixed, we must raise the boiler pressure nearly a couple of pounds per pound of back pressure. We have also to consider that engines do not usually work as well when laboring against a back pressure. The increased steam consumption calls for the evaporation of more water, and consequently for more labor to keep the boilers clean and the furnaces in repair.

Again, with the use of exhaust steam direct into mains and radiators, there is at least 212 degrees Fahrenheit or none. The increase obtainable at the expense of a back pressure is limited (not considering any objections to a back pressure) to 250 degrees Fahrenheit, the temperature of steam at fifteen pounds pressure. This is a small range when compared with water, which may be varied from seventy degrees to two hundred degrees or more.

With a system of exhaust steam direct into the mains, all the condensation is lost, together with the best in the condensed steam, something like 140 degrees of which is available, and is thrown away into sewers. All condensation of any live steam that may be used in time of an insufficiency of exhaust is also thrown away, and this is a most important loss. If a sewer system is not available into which to discharge the condensation, then one must be provided. The hot condensation discharged into sewers often causes disagreeable odors to back up into plumbing, and calls down the wrath of the health authorities. At all air vents, cylinder oil causes unpleasant odors to give the system a bad name. Then, too, a system of piping that will hold air or water, will leak cylinder oil and cause more or less trouble from this source.

Since the range of temperature in steam-heating mains is from 40 to 250 degrees, greater care must be taken to provide for expansion and contraction than in a system where the range of temperature is through narrower limits; and because the temperature of steam systems runs higher than that of water systems, it follows that better and more expensive covering must be used. There is no perfect covering, hence condensation must take place in the mains. This requires that steam mains be carefully graded to avoid pockets, and where pockets are essential, means must be provided for removing condensation. Water mains, on the contrary, can be run regardless of grade.

Strange as it may seem, I have been credibly informed that in case of shut-down, or of a deficiency of heat in extreme cold weather, a steam system is more apt to freeze than hotwater.

The drift of my talk, then, is toward the ideal system, and it is hot water. As a medium for transmitting heat, water has no equal. It meets all the required conditions, and is acknowledged by engineers, architects, and even by the medical profession, to be the ideal heating medium for residences, stores and public buildings.

With a hot-water system as our ideal, then, how can it be best applied to our needs?

It is evident that the water must be heated in a tubular heater, similar to a closed feedwater heater or surface condenser. It is important that sufficient opening be provided through the tubes so that all the exhaust steam can pass through the heater and to the atmosphere without producing any back pressure on the engines. In other words, there must be an open and free exhaust pipe at all times. Sufficient surface must be provided to condense all the exhaust steam delivered by the engine and to allow none to escape. The water is circulated through the space around the tubes, where it absorbs the latent heat in the steam. condensing it. The circulation should be rapid, so as to make the surface efficient. The condensed exhaust steam may be collected in a suitable settling chamber, or filtered to remove the grease, and then the clean hot-water, now freed from all injurious matter, may be returned to the boiler. All the condensed exhaust steam is then saved, and not only is the pure water obtained, but all the heat in it is saved as well; and that means probably eight per cent. of the heat in the exhaust steam. making just so much more available for sale.

In addition to using the heat in the exhaust steam, the system must have heat at times when no exhaust, or an insufficiency of exhaust, is available. Heat must then be supplied from another source, and this may be done in several ways. A live steam connection may be made to the exhaust pipe and live steam blown into and mixed with the exhaust; and in some instances this is done, but the method has objections that seem to make it impracticable. In order to prevent too much live steam from being blown through the heater and to waste, the live steam must be supplied through a re-

ducing valve, and a back-pressure valve is installed in the exhaust pipe to afford a pressure against which the reducing valve can work, thus causing the engine to work under a back-pressure. Then, too, the live steam so used becomes mixed with the greasy exhaust, and not only must be pumped back to the boiler before it can be used over again, but must be purified as well. All this calls for extra care and attention.

Another method for supplying extra heat, in use in some places, is to circulate the water through an ordinary boiler, and thus heat the water in a hot-water boiler direct from the fire. This means that at least two boilers, or two sets of boilers, must be kept going; one set must keep steam to drive the pump used for circulating the water, and the other set heat the water, so an unnecessary number of fires must be kept going. The regular boilers and furnaces must cool down somewhat, and the extra boiler and furnaces be heated up; in the latter, instead of the boiler being at some 333 or 340 degrees, the boiler is at a temperature of 200 degrees, or less. This means that the furnace gases are apt to be chilled, and an imperfect combustion will result. From this comes more smoke and soot, and a loss of efficiency in general; and this in addition to the loss of efficiency due to the cooling and idleness of the regular boilers. It is a well-known fact that the best results are obtained from fuel under a boiler that is in constant use. Therefore the regular boilers should be kept hot as much as possible, and separate hot-water boilers should not be necessary whenever the plant is a little short of exhaust steam. Then, too, extra boilers require extra space in the station and a heavy added first cost.

The way, then, to add heat to the system, aside from that furnished by the exhaust steam, is to use steam drawn from the regular boiler plant and used in a separate heater; one similar to, but, of course, not so large as, the exhaust heater. This heater should be set above the boilers, so that the water of condensation will return to the boilers by gravity and at as high a temperature and with as little loss by radiation as possible. A separate heater permits the use of the full amount of heat in the steam without the possibility of wasting any steam. This condensation is kept absolutely free from oil or other impurities, and is returned to the boiler, saving the need of filtering it and of all power required to feed it into the boiler. This, I believe, is the most efficient means of supplying such extra heat as is required. By its means, in extreme blizzard weather, the full benefit of the exhaust may be obtained with no back pressure; and the water can be raised to a point above that of the exhaust, if necessary, in a far cheaper manner than by carrying back pressure to get such results. The boilers are also regularly under heat, the furnaces always hot, etc. Thus, in the ideal system we shall have a separate heater, for heating the water in time of insufficiency or absence of exhaust steam, set in series with the exhaust heaters with by-passes around each of them so that either may be cut out of service if so desired.

With means provided for heating the water, we can now consider means of circulating it from the central station to the customers. In some instances duplex or single-acting reciprocating, plunger pumps have been used. As is well-known, a steam pump uses steam non-expansively, and consequently is perhaps the least efficient steam motor in the market to-

day. In some instances, as much as 125 pounds of steam per horse-power hour are required. In addition to inefficiency, pistons must be packed and cared for, valves must be looked after and renewed. Each stroke gives a pulsation to the entire system, the noise from which is apt to prove annoying to the patrons. This type of pump also requires considerable floor space, and is expensive in its first cost. The pump for use with a hot-water heating system must be more simple, more durable, and by far more efficient. The centrifugal or blower type of pump best meets the requirements. For moving large volumes of water against moderate heads, no type of pump is so efficient as this. In addition to being much more efficient from the hydraulic standpoint, this pump may be driven from the most economical source of power available. If a line shaft be run continuously, the pump can be belted from that, and the horse-power required be that produced from twenty-six or thirty pounds of steam per horse-power hour. If current be available, one pump may he driven by a directconnected motor and the duplicate unit may be driven by a small, direct-connected, highspeed engine; thus, in any event, using the minimum power for the maximum result. These centrifugal pumps give no pulsation whatever. They turn out a steady, even, continuous stream. There are no valves at all to trouble, and there is nothing about them to get out of order, In fact, there is merely a rotating disk in a chamber. There is nothing about them to break or wear out.

This completes, then, the station equipment required; exhaust heater, live-steam heater, and pump for circulation.

We may now consider the system of distribution, or piping of the territory to be covered by the system. It is quite true that, to a considerable extent, the laws that govern electrical circulation hold for water circulation, and the electrical terms employed may be used with advantage to describe the water circuit.

The houses may be put in multiple; this requiring, of course, two mains wherever customers are obtained. One pipe would be the outbound pipe, and the other for the return water. While at first glance this would seem to answer, yet it is evident that the further out from the station the customer happens to be, the less pressure there is between the two mains, and therefore less tendency to circulate. In other words, the houses near the stations short-circuit the houses far away; and in order to overcome this tendency to short circuit, the taps or service cocks must be made larger toward the ends of the line. Thermostats, too, have to be called into play in each house, in order to assist in equalizing a badly-designed circuit by cutting in resistance in short circuits. To overcome the tendency of the last house on the line to cease circulating, the station pumps must be operated under enormous pressures, even sixty and seventy-five pounds being used in some instances. Such heavy pressures require immense pumps.

The two-pipe system, in certain cases, and properly laid out, is an excellent device. The objection to it is that two pipes of a given size give double the radiating surface that one would give. Two pipes cost nearly double what one would cost. There are twice the fittings and joints to trouble, and twice the provision for expansion must be made. A single-pipe circuit, then, offers the solution to these difficulties. One pipe run in a circuit will answer the purpose of two. The houses may



be shunted off from the pipe, taking advantage, wherever possible, of whatever tendency there may be to circulate, due to gravity. In this system, there will be required one mediumsized main for each circuit. It can be put in for a minimum expense as to cost of pipe, insulation, and labor for laying. This main would be free of obstructions and of low resistance, consequently it would require a minimum power to produce a rapid circulation, which will insure that the load can be carried with small drop. If the main be proportioned properly to the load, with a certain speed of circulation, there can be obtained any predetermined drop in temperature, which should be only twenty degrees Fahrenheit, or such a matter, thus putting the last on practically an even footing with the first. The service pipes need be only of medium size and but slightly more expensive to install than smaller ones and they will be cheaper to operate, because of less resistance and some aid from gravity, thus reducing the circulating power and producing an economy. With this system of piping, then, twice the territory can be covered with a given length of pipe, by using a shunt system, that can be covered with a multiple system and at a much less expense, and it will be far more economical as to the loss of heat by radiation than is the two-pipe system.

The system may be an "open" or a "closed" one. By an "open" system, I mean a system wherein the circuit at the station is open into a tank, and there is at that point no pressure. The water must, be pumped from the heaters into the out-bound mains and raised to the highest radiator, hence, flowing back through the return mains it runs into the tank. Thus, it is evident that the two-pipe plan must be used when the circuit has an open tank at the station. In other words, the pump not only has to circulate the water, but has to overcome the static head of the system. An enormous waste!

If the system were closed—that is, had no open spot in it-then the static head on both suction and discharge would be equal, and the only work the pump would have to do would be to overcome friction in the circuit; it would not have to lift any water at all. This would cut the pumping head down to less than twenty pounds, where in open circuits it is often as much as seventy-five pounds. It might be assumed that this power would not be a less at all, as the exhaust from this power-producing source would be used for heating purposes; but this power is called for twenty-four hours per day, and it is probable that the steam-producing agents in our plant have now enough during the peak of the electric load without added burden, and during a large portion of the time the exhaust from the electrical load is sufficient; so for a couple of hours, during the peak, it would distress us to produce this excessive power, and during a large portion of the twenty-four hours we should have to throw it away, as our electric load gives a sufficient amount. Any extra pumping required is a great detriment, instead of being merely unobjectionable or of no value.

In the electric station it is of great advantage to use storage batteries, charging them during the period of light load and using them to assist when the heavy load comes. Is there an analogous case in heating? The maximum exhaust is produced at the time of the peak; can this advantageously be saved and stored for use during the time of insufficiency of exhaust? It is evident that the load of a heat-

ing plant is limited only by the size of the electric station, as the lights required in any building will furnish only some twenty or twenty-five per cent. of the exhaust required for heating it. The proper size, therefore, for the heating system is such that in the usual winter weather it will require all the exhaust except a little during the peak.

Consider the two sides of the storage tank: First-Assume a ten per cent, loss of heat in circulation. To do this, it is necessary to have the medium move at a rate of from four to five hundred feet per minute. What size of tank would be required to hold sufficient water, with its stored heat to supply from three to five-inch, four to five-inch, or six-inch, mains running at this speed? It would necessarily be of immense size, expensive, occupying much room, and it would itself present a very large radiating surface, requiring extensive insulation, and would then lose much heat. Second -There would be only a little surplus exhaust during the peak to apply to heating the storage. In usual weather this would hardly be sufficient to care for the radiation of the tank alone. There would not be enough under any circumstances to justify the installation of a storage tank. Third—In blizzard weather there would be no surplus for storage. Fourth-In mild weather there would be no need of a storage tank, for there is then sufficient exhaust at all times. Even in the case of a plant without day load, I doubt the advisability of using a storage tank, because the stored water can be used but once, as its storage capacity is limited to the drop on the line of some twenty degrees Fahrenheit, because of the immense size required to make it of any actual value and because of its cost, etc., it cannot prove a paying investment.

In extreme cold weather, put on an extra fireman, or use a little better grade of coal, and use the live-steam heater to make up for the extra cold.

To get the best results, the equipment must be worked at its rated capacity in ordinary weather, and to its extreme capacity in the coldest weather, otherwise, the best efficiency is not obtained.

This about covers the principal requirements for an ideal system, the summary being as follows:

A hot-water system, using closed heaters to absorb the exhaust heat, with sufficient openings to allow all the exhaust to pass through without producing any back pressure, or capacity to condense it all.

A similar, smaller heater to help out this exhaust set above the boilers, that the condensation may be returned to the boilers by gravity. Save all condensation.

Centrifugal pumps, suitably driven, with a closed, one-pipe system of distribution, well insulated.

A load requiring about all the exhaust in medium winter weather, which gives a system wherein the maintenance, operation and investment are minimum, and the efficiency, reliability, simplicity, and satisfaction to all are maximum, making an ideal system.

# Electricity Kills Bacteria.

A cable dispatch from Berlin, June 3, says that an important discovery has been made at the hygienic institute of the University of Wurzburg, where it has been found that bacteria can be destroyed with electric currents.

## SERIES INCLOSED ALTERNATING ARC LIGHTING FOR STREET LIGHTING SERVICE.\*

BY WILLIAM LISPENARD ROBB, Hartford, Conn.

For a number of years previous to 1896 the arc-lamp and arc-light dynamos remained practically unchanged, and most of us were disposed to consider this class of apparatus as having practically reached the stage of final development. No class of electrical apparatus has, however, undergone more radical changes during the past four years than that used for arc lighting. These changes have been brought about by the consolidation of numerous small plants, making it advisable to supply large areas from a single central station, by the introduction of the inclosed-arc lamp and by the fact that the inclosed-arc lamp made possible the successful use of the alternating-current arc lamp.

The inclosed-arc lamp on constant-potential circuits has now been in successful operation for about four years. The series inclosed arc has been in equally successful operation for a period of two years. The superiority of the inclosed-arc lamp has been appreciated by the general public, both when applied to interior lighting and when applied to street lighting. This superiority is not due to a greater mean spherical candle-power, this being undoubtedly very much greater in the open arc than in the inclosed arc when both are supplied with the same amount of energy. The superiority is due, rather, to the greater constancy of the light and its better diffusion, and to the relatively greater life of the carbon and the consequent infrequent trimming of the lamps.

In all long-distance transmissions of electricity, and when large areas are supplied from a single advantageously located power plant, we must, at least in the present state of the art, generate and transmit alternating current. In general, it will, in my opinion, especially if the wires are underground, be found desirable to supply the current to the street lights from the same secondary mains that supply the current for commercial lighting and power. This means that where low-tension secondary mains are in a street, we should do our street lighting with constant-potential inclosed, alternating or direct-current arc lamps, the kind of lamp used depending on the kind of current used on the commercial circuits. There are, however, in all places, large areas in which the streets are lighted by arc lamps, and where there is no commercial lighting or power. These sections can be most economically lighted by series arc lamps.

Various methods of operating series arc lamps from alternating current generating systems have been suggested, and are now in successful operation. These systems may be grouped as follows:

First—Synchronous or induction motors can be used to drive a line shaft, from which are belted the series direct current arc dynamos that supply current to either open air or inclosed direct current series are lamps.

Second — Direct current series are dynamos can be direct connected to either synchronous or induction alternating current motors, and the dynamos used to supply current either to open or inclosed direct current series are lamps.

Third—The constant potential alternating

<sup>\*</sup> Read before the National Electric Light Association at its Twenty-third Convention held at Chicago, Ill., May 22-34, 1909.

current supplied by the generators can be transformed directly by rectifiers into a constant current direct current, and used to operate either series inclosed or open direct current arc lamps.

Fourth—Series alternating inclosed arc lamps can be connected in series, with a reactive coil across the constant potential alternating current circuit.

Fifth—The constant potential alternating current supplied by the generators can be transformed directly by constant current transformers into constant current, and used to operate series inclosed alternating current arc lamps.

I have not included in the possible systems that in which the series arc-lighting system is operated by its own steam plant, as it is practically the unanimous opinion that, with the present condition under which central stations operate, the best results are obtained when one kind of current is generated and this is transformed for the various kinds of service required,

The history of the electric-lighting industry during the past two years seems to have demonstrated that in practically all sections of this country it is possible to replace the open air arc with inclosed arc lamps, and give equal or better satisfaction when the same amount of energy is applied to each type of lamp. As the annual saving per lamp in trimming, carbons, inspection and maintenance of the lamps is approximately ten dollars, it would seem to place the open air arc out of consideration, and the question of street lighting system resolves itself into which of the above mentioned systems should be adopted for operating inclosed arc lamps.

The system of street lighting that will be found best for any given city undoubtedly depends largely upon local conditions. But there are unquestionably many cases where investigation will show that the adoption of the constant current transformer and the series alternating inclosed arc lamp will at present offer the best solution of the problem.

President Carnes kindly requested me to prepare a paper embodying the results of our experience with this system in Hartford, where constant current transformers have now been in use continuously for more than two years.

We are at present operating 804 street lights. Seven hundred of these are operated from constant current transformers on series alternating current circuits. The remaining lights are operated from a constant potential Edison three-wire system. Eight constant current transformers, each of 100-light capacity, are in use. Six of these have been installed in two transformer houses, at a distance from the central station, and are operated without any attendant.

The construction of the 100-light transformers is shown in Figs. 1 and 2. In transformers of smaller capacity there are but two coils, one fixed and one movable, as shown in Fig. 3.

Each transformer is enclosed in a cylindrical tank. The tanks were originally made of boiler iron riveted up. It proved impossible to keep tanks made in this way tight against the transil oil in which the transformer is immersed. The tanks are now made of cast-iron.

The core of the transformer is of the sheet type, with a large central vertical core rising the whole height of the tank. This central core is surrounded by primary and secondary coils, and the magnetic circuit is closed by return paths outside the coils. One of the prim-

aries is fixed at the bottom and the other at the top of the central core. The two secondaries are free to move up and down between the primary coils, and are so connected that when one falls the other rises. They may approach into contact with each other at the middle of the tank, or from this position one may rise toward the primary coil at the top, while the other falls toward the primary coil at the bottom. Connected with the chains by which they are balanced is a lever, which extends outwardly from the top of the oil tanks and carries, suspended from its outer end, an adjustable weight. The lever is supported on a hardened steel knife edge. The weight tends to force the two secondary coils respectively toward the two primary coils. When the transformer is in operation the currents induced in the secondary react upon those in the primary, and tend to force the coils apart. This force is balanced for the desired normal current by the adjustable weight outside of the tank. The 100-light transformers are arranged to operate two circuits of fifty lamps each. The circuits are connected upon the multicircuit principle first used with the Brush series dynamos. The transformer can be adjusted so as to give practically constant current from one-third load to full load. The regulation below one-third load is sufficient to prevent the current from rising to an extent that will endanger a single lamp if all the others should be cut out.

The first lamps were -trimmed every five days, but since adopting the caps now in use it has only been necessary during the long lighting hours of winter to trim once in six days. The trimming is taken care of by two trimmers, and from the results obtained we find that one trimmer with horse and wagon can easily take care of 500 lamps. This would make the annual cost of trimming per lamp, at the Hartford rate of wages, \$2.00 per lamp, as against \$8.00, as was the cost per lamp when the open-air arcs were used.

The cost of carbons per lamp per year is \$1.50 against \$5.84 previously paid for open air arcs.

The cost of inspection has remained unchanged.

The cost of inner globes now averages less than two globes per lamp per year, or about thirty cents per lamp. Both the breakage of outer globes and the repairs on the lamps have been considerably less, but the data accessible are not sufficient to permit me to state this saving exactly. The annual saving in trimming carbons, and repairs made by replacing the open-air arcs with inclosed arcs has undoubtedly been greater than \$10 per year per lamp. The service has been improved; the number of hours lights have been out has been reduced about 50 per cent. During the past six months the records show that out of 804 lamps, the "outages" amounted to 2.2 lamps out all the time. The service furnished by the inclosed arc lamps has been extremely satisfactory to the public and to the board of street commissioners having charge of the street lighting. This board in their last annual report just issued, took occasion to refer to the extremely satisfactory condition of the service, and made especial reference to the small amount of "out-

In most of the tables that have been given. showing the comparative expense of operating the inclosed and open-arc lamps, the breakage of the inner globes is usually stated as much larger than we have obtained in our actual experience. This, I believe, is due to the ex-

perience that the trimmers have gained, as the breakage has materially decreased during the past year. During the past month the rate at which cylinders have been renewed has been about eight-tenths of a cylinder per lamp per year. The smallness of the renewals is also in great part due to the fact that the cylinders are cleaned every time the lamps are trimmed,

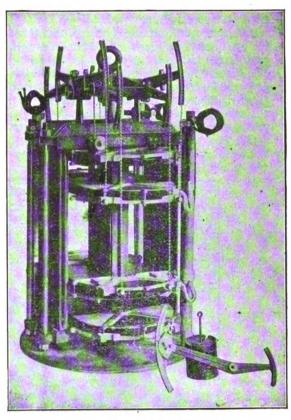


Fig. 1.—100-Light Constant-Current Transformer.

and consequently can be cleaned with a brush and hot water, and no acid is required for removing the deposit.

The success or failure, of the introduction of inclosed-arc lamps depend largely on whether the cylinders are kept clean. They should undoubtedly be cleaned every time the lamp is



Fig. 2.—Case of Constant-Current Transformer.

trimmed, and not at the lamps, but at the central station.

The transformers and arc lamps were made the subject of careful tests, and the results of these tests have been embodied in a paper already read by the author before the American Institute of Electrical Engineers.\* The aver-

<sup>\*</sup> Meeting held September, 1899.

age results obtained from two 100-light transformers are as follows:

Load.	Efficiency.	Power factor.
1	88.1	24%
1	92.3	44%
8	94.9	62%
Full.	96.1	78%

The rise in temperature of the oil in the transformer measured, at the top of the iron core where it is greatest, 39 degrees C. after twenty-four hours' run.

Under the usual conditions of street lighting the dynamos at all times carry at least 90 per cent. of the full load, and at this load the efficiency and power factor of the constant-current transformer alternating system are satisfactory. The power factor is approximately the same as that obtained with induction motors at the average load at which they are operated. The low power factor at fractional loads makes the use of a constant-current

any attendant. Although the voltage at the terminals of the primary of the transformer is subject to a variation of several per cent. during the street-lighting hours, the current supplied to the series lighting circuit is practically constant. The records that I have with me record the operation of transformers located in a sub-station about a mile from the central station. These transformers take their current from the feeders that supply the commercial lighting and power system. We have had no single interruption in the service due to the fact that the transformers are operated from transformer-houses, with no attendant in charge of them.

The lamps that have been used in Hartford are of the carbon feed type and differential. The power factors, as given in the above table, were measured on the primary side of the transformer, with differential lamps on the secondary. The power factor would be consid-

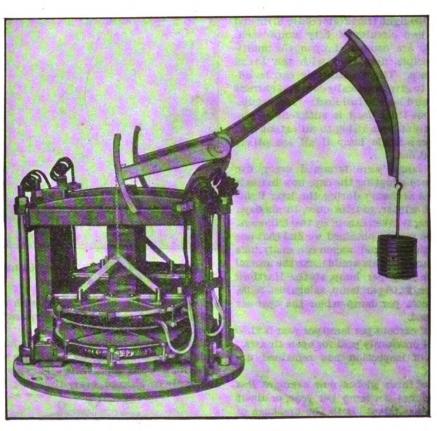


Fig. 3.—50-Light Constant-Current Transformer.

transformer undesirable when the conditions are such that the transformer is not operated at a large part of its rated full load.

It has been found in practice that the transformers can be maintained and operated successfully with little attention. At Hartford. six of the transformers have been operated during the entire past year from two outlying sub-stations. There is no attendant at either of the stations. The inspector of the district cuts on and off the lights at the proper time, and visits the sub-station once during the night. Each transformer is equipped with a recording Bristol ammeter, so that a complete record is kept of the time of cutting on and off the circuit, and of the time the inspector makes his nightly inspection, and of the working and adjustment of the transformer. We have a complete daily record of the operation of the transformers since their installation, and I have with me a large number of these records that demonstrate how perfect the regulation of the constant-current transformer is, even when operated from sub-stations without

erably increased if satisfactory shunt lamps were used. Lamps of this type, however, with which I have had the fortune to experiment, have not proved satisfactory when compare with the differential lamp, and it was considered that the differential lamp was a better one to use, even if its use reduced the power factor of the system several per cent.

The following brief comparison of the series inclosed alternating-current arc lighting from constant-current transformers with the other systems of series-inclosed arc lighting suggested in the earlier part of the paper, may prove interesting. In making the comparison between the different systems, I have assumed, and believe it to be true, that equally satisfactory results in street lighting can be obtained from the 6.6 ampere inclosed direct current, and the 7.5-ampere inclosed alternating-current arc lamps. The comparison is confined to these two lamps under full-load conditions, as in series street lighting this is the usual working condition.

First-Comparison of system using direct-

current arc dynamos, belted from a line shaft driven by motor.

Actual experience in the Hartford case showed a saving in power of 150 watts per lamp, when 400-watt alternating-current lamps supplied from constant-current transformers replaced nominal 1,200 candle-power open-arc lamps. This, assuming the value of power at the switchboard as one cent per kilowatt-hour, would mean an annual saving in the cost of power of six dollars per lamp per year in favor of the constant-current transformer system. The saving of space in the central station has been very considerable, the space occupied being not more than one-tenth as great as the space formerly occupied by the line shaft and arc-light dynamos. The repairs on shafting and belting are entirely eliminated and the maintenance and repairs on the constant-current transformers very materially less than the repairs and maintenance of the arc dynamos and motor, and the services of an attendant have been dispensed with.

Second—Comparison with system using direct current arc dynamos driven by induction motor.

The combined efficiency of the induction motor and series are generators is approximately 80 per cent. The power factor of the induction motor is 90 per cent. The efficiency of the transformer is 96 per cent, and the power factor of the entire system, 78 per cent. The number of watts supplied to the lamps is approximately the same. By the use of the alternating system there is consequently a saving in actual power and load on the engine of 18 per cent., and in apparent load, and consequently in the capacity of the generators, of about 10 per cent.

On a 1,000-light equipment one attendant would be required to look after the arc-light generators, whereas the amount of attendance required by the constant current transformers is apparently negligible. This makes possible the placing of the constant current transformers in a sub-station. This frequently greatly simplifies the wiring system. In the case of a central station operating 1,000 lights in half a dozen neighboring towns, careful estimates were recently made of the relative cost of the wiring system if the lamps were operated from motor-driven are dynamos placed in the central station, and if operated from constant current transformers placed in the transformer houses in various towns. There was found to be a saving in the first cost of the installation of the wiring system of \$11,000 in favor of the constant current transformer system. Constant current transformers take up only about half the space of the motor-driven dynamos; the initial cost of the transformer is much less than the cost of the motor-driven dynamo, and the repairs and maintenance are also less.

Third—Comparison with series alternating arc lamps, operated in series with a reactive coil.

If the reactive coil and arc circuits are placed directly across the bus-bars, they introduce the grounds on the series arc circuits on the general system, and also limit the series arc circuits to a comparatively small number of lights. This will, in general, make it advisable where this system is used to introduce step-up static transformers between the bus-bars and the series arc lighting circuits. These transformers serve the double purpose of removing the arc light grounds from the bus-bars, and also make it possible to increase the number of arc lights operated on each circuit. Other things being equal, it is of course preferable to have

the transformer and reactive coil combined in one piece of apparatus, as it is in the constantcurrent transformer.

If the reactive coil is installed with step-up transformers and is installed with sufficient capacity to protect the lambs at all loads between no load and full load, the advisability of adopting one of the alternating systems rather than the other will depend largely on the relative reliability of the lamps furnished with the two systems. The series differential alternating lamp has now stood the test of actual service for two years, and is able to fulfill the requirements of a satisfactory lamp. It is to be hoped that a shunt lamp will be made that will do the work equally satisfactorily, although it seems extremely doubtful if a shunt lamp can be made to work on series circuits as satisfactorily as a differential lamp. The use of the shunt lamp would mean a very material increase in the power factor of the alternating series are lighting systems.

Fourth—Comparison with system using series inclosed direct-current arc lamps, supplied with current from rectifiers.

In this country, up to the present time, it has been impossible to manufacture satisfactory rectifiers intended to operate on a frequency of sixty cycles. It is considered practicable, however, to make rectifiers that will operate at twenty-five cycles. Even if sixty-cycle rectifiers could be made to operate satisfactorily, it is doubtful if they could compete with the constant-current transformer, as in addition to the constant-current transformer, they would have complicated rectifying devices, and would require the services of an attendant.

With twenty-five cycles it is impossible to operate alternating-current arc lamps. The constant-current transformer system could therefore be used only in connection with frequency changers. Consequently, when central stations operate at low frequency, the introduction of rectifiers will be advantageous, the advantages of the rectifier over the system in which series arc dynamos are direct-driven by motors being in many respects the same as the advantages of the constant-current transformer over the same system.

I venture the prediction that in the near future in the great majority of the cases where alternating current is generated, if the frequency is sixty cycles to the second, the series are lighting will be by series inclosed alternating are lamps, and if the frequency is twenty-five cycles the series are lighting will be by direct-current inclosed are lamps, supplied by current from rectifiers.

It is to be hoped that this paper will serve to open up a discussion in which the merits and faults of the various systems of series are lighting will be fully brought out by those who have had actual experience with the different systems.

# Proposals Invited.

The Bureau of Supplies and Accounts of the Navy Department is inviting sealed proposals until June 12 for furnishing the New York Navy Yard with a quantity of motors. Blank proposals will be furnished upon application to the Navy Pay Office, New York City.

The Treasury Department is inviting sealed proposals until June 19 for installing an electric light and power plant, including engines, generators and switchboard, in the United States custom house building at St. Louis, Mo. Specifications and plans can be obtained upon

application to the Secretary of the Treasury or of the custodian of the building. Requests for plans and specifications must be accompanied by a check for \$10 as a guarantee that the plans will be returned to the department. The amount will be refunded on their receipt.

The Treasury Department is inviting sealed proposals until June 12 for installing a system of electric light wiring in the U. S. Public Building at Portland, Me. Plans and specifications can be obtained upon application to the custodian of the building.

# ELECTRIC TRAMWAYS IN LONDON.

[From our London Correspondent.]

It is contemplated that by July the electric tramways in West London will be opened for traffic. The London United Tramways Company has adopted a special car of superior design at a cost of about £1,000 each. The greater part of the system will be worked on the double trolley method, so as to avoid interference with the magnetic observatory appar atus by leakage to earth. A short length is to be operated on the conduit system. About 30 or 40 miles of way will be worked electrically within a month or two, but the company's enterprise does not end here for it has just applied to Parliament for power to construct over 17 miles of extensions to be worked by overhead trolley, between Acton and Hanwell in the western district. The generating station is being rapidly pushed forward at Chiswick, on the site of the old horse-car depôt. Here it is proposed to have ample car storage, and there is room for a power house of 5,000 hp. capacity. It goes without saying that in the construction of the power house the latest improvements will be introduced, for Mr. J. Clifton Robinson, whose name will be remembered in connection with the extensive trolley lines of Dublin, Bristol and Middlesbrough, is the leading spirit in the enterprise. The power house is a one-story building of brick and freestone 154 feet long x 106 feet wide, divided into engine and boiler room. The boiler room is 45 feet wide and consists of a steel frame structure in order to carry the heavy weights due to the coal storage bunkers (holding 500 tons), economizers, flue and water tanks, which are located on a floor above the boilers. This steel structure extends to the roof, and thus makes the boiler-room practically independent from the engine room.

The coal supply will be delivered from the ground level outside the building to the coal bunkers above the boilers by a noiseless gravity bucket type of conveyor, capable of handling 40 tons per hour. This conveyor will also remove the ashes, dumping them into a special ash bin from which they can be readily removed. An additional coal store of 2,000 tons capacity will be provided north of the boiler room. It is intended to deliver coal to the stores direct from the North & South-Western Junction Railway's depôt, about 700 feet distant from the boiler room, by means of a gravity bucket conveyor. Alongside the siding, and entirely below the surface, will be placed a receiving hopper with the necessary apparatus for the delivery of coal to the conveyor, thus enabling the coal to be handled automatically direct from the railway trucks, and to and from the company's coal stores and to the stoker hoppers.

The boiler room equipment will consist of eight horizontal water-tube boilers each hav-

ing a capacity of evaporating 8,250 lbs. of water per hour at a steam pressure of 160 lbs. Each boiler will be fed by a mechanical stoker of the "Coking" type, the coal being delivered to the stokers by weighing hoppers from the coal bunkers above the boilers, thus securing a record of the exact amount of fuel consumed by each boiler.

The economizer, located on the floor above the boiler room, will consist of 360 tubes in 36 sections, provided with motor-driven scraping and cleaning arrangements. Here also will be two water tanks of 6,000 gallons each.

The smoke stack is to be 10 feet clear inside diameter, and 200 feet in height above the foundations. This stack will be built of steel plates in rings, lap jointed and riveted, tapering upwards, and finished with an ornamental cap. It will be entirely self-supporting and lined inside with firebrick.

The engine room will contain one 25-ton overhead traveling crane traversing the length of the room. There will be three vertical cross-compound condensing 750 hp. engines, with cylinders 22 inches, 44 inches, and 42 stroke; three of them running at 90 revolutions per minute, and each of these having two kw. electric generators; the fourth engine, running at 94 revolutions per minute, will be direct coupled to a 500 kw. 3 phase, 5,000 volt generator, with a frequency of 25 cycles per second.

The lighting sets will consist of two 2-crank tandem compound engines, each directly coupled to a 75 kw. 500 volt generator, and running at 400 revolutions per minute.

The condensing apparatus will consist of surface condensers of the Admiralty type, each containing 3,200 square feet of cooling surface and located on the engine room floor. Each condenser will be supplied with a vertical cross-compound combined air and circulating pump, with steam cylinders 8 inches and 15 inches, and air and water cylinders 20 inches, double acting, all 15-inch stroke.

Two cooling towers will be erected for cooling the water for condensation, these being of the twin type arranged in two sections, having capacity to care for 4,000 hp., covering a ground space of 40 feet by 15 feet, and 38 feet high. The mats composing the cooling surface will be of galvanized iron wire netting, and a proper distributing system for the water over these mats will be provided. There will be two air propellers for each section of tower, operated at 160 revolutions per minute by a direct-connected electric motor, when giving maximum capacity; two vertical compound duplex boiler feed pumps, each of sufficient capacity, will feed all the boilers. The hotwell will consist of a cylinder 48 inches diameter and 96 inches long, the feed water for the hotwell being passed through two feed water filters to thoroughly extract all oil before passing to the boilers. An auxiliary feed water heater will be supplied having 520 square feet of heating surface for heating the feed water before passing it into the economizer, exhaust steam from the boiler feed pumps and other auxiliaries being available for this purpose.

One motor generator set, consisting of one 3-phase synchronous motor, having 500 kw. capacity at 5,000 volts, and direct connected to two 250 kw. 500 volt generators will be located in the engine room for converting from direct to alternating current and vice versa, for convenience on light loads and as a spare generating unit.

The switchboard of white marble two inches



thick, bolted to angle iron framing, will contain tengenerator panels, two lighting generator panels, one instrument panel, nine feeder panels, and also two 3-phase generator panels, and two 3-phase feeder panels, and will be supplied with the necessary instruments and switches.

The electrical current will be distributed over the whole of the company's system by lead-covered, paper-insulated cables, drawn into cement-lined, wrought-iron pipes laid under the foot paths of streets. As many as thirty of these cables radiate from the central power station at Chiswick, over one million feet of these pipes being required.

The London United system is almost entirely double track, and over the rails of each track will be located two trolley wires about 21 feet in height from the ground, the two inside wires being inter-connected and forming the neutral. The overhead lines will be divided into half-mile sections, and in order to meet the Board of Trade requirements, each mileand-a-half of the line being supplied by an independent feeder running direct from the power station, the neutral return also being reinforced for each section of a mile-and-ahalf by a separate feeder.

A section of the line furthest from the center of the system, about eight miles in length, will be operated from a sub-station. This substation will be fed from the central power station through duplicate three-core, lead-covered, paper-insulated cables, power being transmitted at 5,000 volts on the three-phase system. The sub-station will have a switch board consisting of two 3-phase high tension feeder panels, six transformer panels, four rotary converter panels, four feeder panels, and two instrument panels, the switchboard being similar in design and finish to that in the main generating station. In the sub-station will be provided seven static transformers (one being an extra), each of 150 kw. capacity at 25 cycles per second, transforming 5,000 volts to approximately 350 volts. The cooling air for these transformers will be supplied by an electric motor directly connected to a suitable fan. Four rotary converters will also be supplied each of 200 kw. capacity, and 6-pole machines running at 500 revolutions per minute, and delivering current at 550 volts, for supplying sections of the line radiating beyond six miles from the central power station at Chiswick.

The sub-station is designed generally on the lines of that already existing at Stockton, but there is a difference in the electric connections, owing to the rotary converters feeding into a three-wire system. These machines will be electrically connected, so as to act both as rotary converters and as balancers: that is, in case one side of the three-wire system be over-loaded, the rotary converter acting on the opposite side of the system will act as a motor, and thus assist the over-loaded machine.

The rolling stock to be used over the whole system will practically be a duplicate of that in use on Tees side. The usefulness of single units of traffic, in the shape of 8-wheel bogie cars, to meet and successfully handle large volumes of traffic has been most satisfactorily demonstrated at Stockton, Middlesbrough and Thornaby.

# Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended June 2:

Amsterdam, 2 cases, \$59; Antwerp, 6 cases,

\$1,486; Argentine Republic, 4 cases, \$354; 27 packages, \$1,487; Barcelona, 21 packages, \$4,-475; Berlin, 1 case, \$5; Brazil 24 packages, \$1,-092; 1 case, \$80; Breslau, 1 case, \$16; Bristol, 124 packages, \$5,820; British Guiana, 22 packages, \$1,015; British Possessions in Africa, 18 cases, \$1,313: British West Indies, 14 packages, \$278; Brussels, 2 cases, \$450; Central America, 29 cases, \$912; Cuba, 23 boxes, \$15,100; Genoa, 5 cases, \$2,119; 1 box, \$20; Glasgow, 29 cases, \$6,025; Gyon, 10 cases, \$288: Hamburg, 157 packages, \$22,086; Havre, 244 packages, \$15,852; Hayti, 2 cases, \$35: Lisbon, 2 cases, \$396; Liverpool, 29 packages, \$5,000; 16 cases, \$273; London, 151 cases, \$37,291:154 packages, \$7,205: 6 boxes, \$124; Margate, 3 cases, \$5,367; Mexico, 47 packages, \$1,349; Naples, 26 cases, \$7,400; New Foundland, 50 packages, \$327; Nova Scotia, 1 package, \$52; Peru, 8 packages, \$284; Porto Rico, 2 packages, \$22: Southampton, 4 cases, \$44: Vienna, 2 cases, \$21: Zurich, 2 cases, \$25.

## PERSONAL MENTION.

Mr. Fred. Kenny of Harrisburg. Pa., has been elected superintendent of the Steelton Electric Light & Power Com pany.

Mr. Carl Hering. President of the American Institute of Electrical Engineers, sailed for Europe last, Saturday. He is a member of the Jury of Awards in the Electrical Department of the Paris Exposition, and will be in Paris for three months or more.

Prof. Rowe of the electrical department of the University of Colorado has received a year's leave of absence, and at the close of the commencement exercises will ge to Schenectady, N. Y., where he is to occupy a position with the General Electric Company.

Mr. J. A. Leonard, formerly engineer of the Hudson River Power Transmission Company at Mechanicsville, N.Y., has accepted a similar position with the Kane Falls Electric Company.

# INCORPORATIONS.

The Maumee Valley Electric Company, Toledo, O. Capital stock, \$100,000.

The Paris Electric Light Company, Limited, Toronto, Ont. Capital stock, \$20,000.

The Carteret Electric Light & Power Company, Carteret, N. J.-to heat and light by electricity and to carry passengers. Capital stock, \$20,000. Incorporators: Quinn, Jr., of Carteret, William J. Leary, Elizabeth, and Walter K. Whittaker, Sewaren.

The Fraley Electro-Therapeutic Company, Atlantic City, N. J.—tc deal in electrical appliances. Capital stock, \$100,000, Incorporators: H. B. Cook, E. A. Hill, A. A. Redfield, all of Atlantic City.

The Electro-Magnetic Brake Company, Union, N. Y .- to manufacture an electric brake for electric elevators, etc. Capital stock, \$50,000. Incorporators: Fiehm, H. C. Steinhoff, L. A. Menegaux, J. S. Darling, T. R. Rabone.

# ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL. Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS. at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N.W., Washington, D.C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents. Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL. Nos. 302-304. Broadway. New York City. N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon p ment of ten cents. When ordering give name, date and title

# LETTERS PATENT ISSUED MAY 29, 1900.

# ELECTRIC RAILWAYS AND APPLIANCES.

650,364. Electric-Railway System. Albert H. Armstrong, Schenectady, N. Y., assignor to the General Electro Company of New York. Filed April 8, 1829.
650,384. Trolley. Charles M. Feist, Sioux City, Iowa. Filed Oct. 2, 1899.

650,406. Combined Automatic Fender and Brake for Tram-Cars, etc. Wilhelm Mack, Hanover, Germany. Filed

650, 406. Combined Automatic Fender and Brake for Tram-Cars, etc. Wilhelm Mack, Hanover, Germany. Filed Dec. 2, 1899.
650, 452. System of Train Control for Electric Motors. Frank E. Case, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed April 12, 1898.
650, 491. Car-Fender. Earl Sherwood, New York City. Filed Sept. 15, 1899
650,585. Underground Electric-Railway System. John B. Larkin, Pittsburg, Pa. Filed Nov. 8, 1899.
650,586. Electric Railway. John B. Larkin, Pittsburg, Pa. Filed Dec. 28, 1899.
650,762. Car-Fender. Richard F. Preusser, Washington, D. C. Filed Dec. 23, 1899.
650,765. Trolley. George R. Tomb, Lorain, Ohio. Filed Oct. 13, 1899.
650,844. Suspension Device for Trolley Wires. James W.

Oct. 13, 1899. 84. Suspension Device for Trolley Wires. James W. Scully, Hyde Park, Mass. Filed Feb. 5, 1900.

## ELECTRIC LIGHTS AND APPLIANCES.

650,368. Incandescent Vapor-Burner. Benjamin C. Bradley, Alliance, O. Filed April 7, 1899.
650,418. Casing and Lamp-Socket for Portable Electric Lamps. David P. Perry, Chicago, Ill. Filed April 28, 1899.

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650,531. Incandescent Lamp. Reginald A. Fessenden, Allegheny, Pa., assignor of one-half to Grant McCargo, Pittsburg, Pa. Filed Aug. 25, 1899.
650,668. Electric Lighter for Incandescent Burners. Gustave Burkhardt and William Schuber, Chicago, Ill., Filed Feb. 8, 1900.
650,735. Incandescent Vapor-Burner. John J. Snyder, Denver, Col., assignor to the Standard Gas Lamp Company, No. 1, 1800. ver, Col., assignor to the Stand Chicago, Ili. Filed July 1, 1899.

# ELECTRICAL MACHINERY AND APPARATUS.

650,370. Apparatus for Starting Motors William Cooper, Cincinnati, O., assignor to the Bullock Electric Manufecturing Con pany, same place. Filed March 24, 1900. 650,425. Automatic Magnet Circuit Breaker. William M. Scott, Philadelpha, Pa., assignor to the Cutter Electrical & Manufacturing Company of New Jersey. Filed Jan. 31, 1898.

31 1898, 430. Electric Current or Motive-Force Controller. Ar-thur L. Stevens, New York City. Filed Oct. 28, 1899. 602. Electric Fuse or Cut-Out Louis W. Downes, Provi-dence, R. I. Filed Oct. 18, 1899. 666. Apparatus for Controlling Electric Motors. Arthur W. Berresford and Henry J. Wiegand, Westfield, N. J. Filed March 22, 1902.

Filed March 2, 1900 704. Automatic Apparatus for Protecting Compound-Wound Dynamos. Charles N. Black, New Haven, Conn. Filed Aug. 15, 1898.

## TELEPHONES AND TELEPHONE APPARATUS.

TELEPHONES AND TELEPHONE APPARATUS.

650,426. Supervisory Signal for Telephone-Switchboards. Charles E. Scribner, Chicago, Il., assignor to the Western Electric Company, same place. Filed March 15, 187. Renewed Oct. 14, 1888.

650,485. Signal for Telephone Trunk Lines. Charles E. Scribner. Chicago, Ill., assignor to the Western Electric Company, same place. Filed June 17, 1898.

650,487. Pilot- signal for Telephone - Switchboards. Charles E. Scribner. Chicago, Ill., assignor to the Western Electric Company, same place. Filed June 17, 1898.

650,487. Calling Appliance for Telephone-Switchboards. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Feb. 9, 1899.

650,489. Toll-Collecting Appliance for Telephone Pay-Stations. Charles E. Scribner, Chicago, and Frank R. Mc-Berty. Evanston, Ill., assignors to the Western Electric Company, Chicago, Ill., Filed April 12, 1899.

650,489. Connection Counter for Telephone Lines. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Oct. 21, 1899.

650,548. Telephone-Exchange System. Walton Smith, Ridley Park, Pa., assignor to James S. Thompson, North Tonawanda, N. Y. Filed June 9, 1899.

650,570. Signaling System. Lester C. Smith, Torrington, Conn. Filed April 27, 1898.

# MISCELLANEOUS.

MISCELLANEOUS.

650,381. Facsimile Telegraph. William P. Dun Lany and Herbert R. Palmer, Cleveland, O., assignors to the International Facsimilegraph Company, same place. Filed March 31, 1899.

650,409. Graphophone Reproducer and Recorder. David L. Minier, Ithaca, N. Y. Filed Nov 10, 1899.

650,417. Portable Strrage-Battery Cell and Containing-Case Therefor. David P. Perry, Chicago, Ill. Filed April 28, 1899.

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Oct. 28, 1899. 199. Electric Belt. Paul Wenigman, Chicago, Ill., assignor to Michael A. McLaughlin, same place. Filed March

nor to Michael A. McLaughlin, same place. Filed March 14, 1960.

550,550. Electric Cable. Milton I. Baird, Glenfield, Pa. Filed Aug. 25, 1890.

650,551. System of Electrical Distribution. Milton I. Baird, Glenfield, Pa. Filed Dec. 1, 1899.

650,558. Propelling Mechanism for Boats. Tracy B. Hatch, Chicago, Ill., assignor by direct and mesne assignments, to the Subruerged Electric Motor Company, Menomonie. Wis. Filed May 18, 1899.

650,646. Apparatus for Electrolytic Reduction of Ores. Frederic H. Long, Chicago, Ill., assignor, to Ross J. Beatty, trustee, Muncie, Ind. Filed June 22, 1898. Renew d Nov. 6, 1899.

650,657. Means for Maintaining Synchronous Rotation of Dynamo Electric Machines. Henry Geisenhoner and Charles D. Knight, Schenectady, N. Y., assignors to the General Electric Comany of New York. Filed Nov. 16, 1899.

1899.
739. Method of Duplicating Phonograph Records.
Henry G. Wolcott, Fishkill-on the-Hudson, N. Y. Original application filed July 25, 1899. Divided and this application filed March 22, 1900.
747. Process of Treating Carbid of Calcium. John Bilbie and Henri Drivet, London, England. Filed Oct. 6, 1838.

18:38. Secondary Battery. James P. Clare, Quincy, Mass. Filed Nov. 22, 1899.

# DESIGN.

141. Insulator. Fred M. Locke, Victor, N. Y. Fied April 26, 1900.



# THE TELEPHONE WORLD.

# To be the Bell Company's Rival.

(From the New York Commercial.)

The Western Union Telegraph Company will engage in the telephone business on a vast scale and tackle its great rival, the American Bell Telephone Company, on its own ground. The first admission that such a thing is to be done came from one of the leading directors of the Western Union Telegraph Company. It has been kept a profound secret thus far, so as to give the Western Union an opportunity to float the necessary securities for prosecuting the war, and in order not to allow its rival any chance for retreaching itself.

It is this coming fight that led the Western Union to authorize the issue of \$20,000,000 new 4½ per cent. bondr, and, curiously enough, the directors intended at first to issue only \$10,000,000, and within a few days changed their minds and made it \$20,000,000. A little more than one-half of the first \$10,000,000 will be needed for retiring the old debentures.

At the time these bonds were authorized the officials of the company denied that they intended to go into the telephone business, and they have publicly stuck to this statement ever since. They declare that the new bonds will be needed largely for replacing old lines and poles.

There is some truth in this, but orders have gone out to string large amounts of copper wire particularly adapted to the telephone business between leading cities. The inference is that the first telephone lines to be established by the Western Union will be long distance ones. At the same time the Western Union has the facilities for establishing a vast network of local lines throughout the United States, and it will be a simple matter to attach telephones to the existing wires, and use them either for telephone or telegraph purposes.

It was learned that the part of the Western Union's business, as well as that of the Postal Telegraph Company which has suffered most is the private line service. The Bell Telephone Company, it is said, by means of its long distance service has absorbed three fourths of this entire business, which is immensely profitable, and the Western Union has felt the loss severely. If necessary, the Western Union will install telephones in all parts of the country and make a specialty of local business as well as long distance.

This is only one side of a great warfare, which is fast developing, and which bids fair to cause disaster to some of the contending companies. The Bell Telephone Company is beset, on the other hand, by the Telephone, Telegraph & Cabbe Company of America, a \$30,000,000 company, which is backed by such men as Martin Maloney, of Philadelphia, and John Jacob Astor, of New York, and is supposed to have the support of the Whitney syndicate.

This young telephone company is reaching out in all directions, and it has already secured enough of the local companies throughout the United States to seriously threaten the business of the Bell Company. It struck a body blow when it absorbed the Erie Telephone & Telegraph Company.

The Home Telephone Company of North Tonawanda, N.Y., has been incorporated with \$100,000 capital. Judge Albert R. Smith is president of the new company. This is the concern which was lately given a franchise to construct a system in North Tonawanda. The poles and wire have been ordered and work on the construction of the new line will be started within two weeks. The new company will sell 50 per cent. of its stock to local subscribers, and the balance of stock will be held by the Rawson Electrical people and Niagara Falls financial men. At the present time this independent company has franchises in Niagara Falls and North Tonawanda, and has applied for a franchise in Lockport. With a system constructed in these three cities the officials believe that they will make it quite warm for the Bell concern.

The telephone line between Richmond, Ky., and Irvine has been completed. The line is 25 miles long, and connects with the villages of Moberley, Waco. College Hill, Brassfield, Speedwell, Panola, Rice's Station and Logston's Store. The line will be extended to Clay City, Powell County, in the

The telephone companies at Fort Dodge, Ia., and Boone, have signed a contract for the construction of a copper return circuit toll line between Des Moines and Fort Dodge. Des Moines, Boone and Fort Dodge will be the only toll stations on the new line.

At the annual meeting of the La Crosse (Wis.) Telephone Company the following officers were elected: President, I. H. Moulton; vice-president, W. W. Cargill; secretary and treasurer, William Lohmiller.

The Diller Telephone Company organized at Diller, Neb. about a year ago, has made connection with the Fairbury Telephone Company of the same place.

## Knickerbocker Telephone Company Not Violating Law.

In a joint resolution passed by the Municipal Assembly on May 8 information was requested as to the alleged installment of poles and lines by the Knickerbocker Telephone Company in this city without grant or franchise. The resolution was sent to the mayor and allowed to become operative without his signature.

President W. H. Eckert, of the Knickerbocker Company, was seen recently concerning the resolution. He said that the company was formed under the transportation laws of the State, telegraph section, which permitted the company to conduct a telephone and telegraph business in the city on fulfilling police regulations, which require permits from the department of buildings, lighting and supplies, and the department of highways.

President Eckert stated that these conditions have been fulfilled in every detail, and exhibited permits from the departments mentioned to substantiate his statement. He declared that by the law under which the company was established it was not necessary to secure a grant or franchise from the Municipal Assembly. He said:

"It would seem rather weak on our part to go on estab-

"It would seem rather weak on our part to go on establishing our plant if we did not have authority. We have consulted our attorneys, and find that we have in every way fulfilled the letter of the law."

It is announced that the negotiations of the promoters of the Illinois Telephone & Telegraph Company have been broken off, and that a great conduit scheme has been taken up by the capitalists interested. The Philadelphia syndicate, according to a Chicago paper, refused to purchase the Illinois Company's franchise at terms satisfactory to the latter. An agent of the Independent Telephone Company has been in Chicago for several days looking over the plant of the local company, but the officials say he wanted the property at bargain-counter figures, and he returned to Philadelphia without investing in the new telephone enterprise. original promoters of the Illinois Company will probably abandon the telephone scheme, and go into the conduit business. They have secured additional capital, and in a week or ten days will begin again the construction of their conduits. In time an ordinance will be presented to the city council asking for the privilege of renting space in the company's conduits to electric lighting, telegraph, gas, and other companies using underground space.

An independent telephone company is endeavoring to gain a foothold in Louisville. Ky. Subscribers who will become members of the new exchange are being requested to sign papers, and armed with these the petition for the new concern. The rates of the rival company will be greatly reduced and a telephone war will result in all probability, if it gets a start. Since the action of the telephone exchange in putting in pay stations at all drug stores and in restricting persons to the use of their own telephones generally, there has been much dissatisfaction expressed among the patrons, and the new company will have easy sailing with a number of people in that city.

The Harrisburg, Pa., "Independent" is authority for the statement that the sentiment in favor of a competitive telephone system in Harrisburg continues to grow. It adds that in spite of the efforts of certain officials to dragoon councilmen into the support of the Bell telephone monopoly, the prospects of the passage of the ordinance granting a franchise to the Harrisburg Telegraph & Telephone Company grow brighter day by day. The business element of the city is wide awake to the importance of the matter and is making its influence felt.

The independent telephone movement is making rapid progress in Central New York, as is indicated by the plans of the Rochester Telephone Company for controlling all the territory within a radius of 40 miles of that city. Orders have been given to build 1,000 miles of lines. The capitalists back of this company are the ones who have applied for a franchise in Buffalo, and their plan is to build a connecting link between the two cities. It is understood that they are working in harmony with the Telephone, Telegraph & Cable Company of America, and it is likely that the up-State companies will be brought into the general group which is fighting the Bell Telephone Company.

The Cumberland Telephone & Telegraph Company of Louisville, Ky., has rescinded its recent order prohibiting the use of telephones by any other than the actual subscriber unless the subscriber himself made the call and authorized the use of his 'bhone.

Omro, Wis., has refused a franchise to the Wisconsin Telephone Company to operate an exchange. The Wolf River Telephone Company operates in the village.

# J. E. Keelyn's Liabilities.

James E. Keelyn, formerly president of the Western Telephone Construction Company of Chicago, has filed a petition in bankruptcy in the United States Court. His liabilities amount to \$523,175, while his assets are figured at \$71,797. Mr. Keelyn held stock in many companies and his contingent liabilities upon his holdings, which form a large portion of the scheduled indebtedness, are as follows: Western Telephone Construction Company, \$97,500; American Hardware Manufacturing Company, \$38,500; Wisconsin Valley Telephone Company of Wisconsin, \$25,000; Chippewa Falls Telephone Company of Wisconsin, \$25,000; Chequamegon Telephone Company, Ashland, Wis., \$50,000; W. Newton Smith, Tarboro, N. C., \$10,000

The Buffalo (N. Y.) "Courier" says: "If the board of aldermen should prove stubborn and refuse to grant a franchise to the Buffalo Telephone Company, the new corporation now getting subscribers every day in Buffalo, the time may soon come when the officers of the company will proceed to lay conduits and wires in the streets w thout asking permission of the common council."

A dispatch from La Crosse, Wis., states that the West Salem Telephone Company of West Salem, Wis., organized in opposition to the I'eli interests, has been incorporated. The incorporators are Wm. Lohmiller, J. George Schweizer and C. H. Schweizer, all of La Crosse. The new company expects to have a local independent exchange in operation in West Salem within 60 days.

The Henry County Telephone Company, with headquarters at New London. Ia., has a line to connect with Mt. Union on the north in course of construction. When this line is completed there will only be two townships in the county without a telephone line, Jackson and Trenton.

The Farr Telephone & Construction Supply Company, 857 Dearborn St., Chicago, is becoming well known in every State in the Union. The good reputation it has gained during the past six years has placed it as one of the most reliable and successful business houses in the country. It manufactures everything in the telephone line.

It is rumored that the Hudson River Telephone Company will absorb the Troy (N. Y.) Telegraph & Telephone Company. The Hudson River Telephone Company is capitalized at \$2,000,000, and the other at \$250,000.

The Inland Telephone & Telegraph Company, of Spokane, Wash., will begin work in a few days on a new line from Coulee (ity in Grand Coulee, to Waterville, Douglas County, Wash., in the Big Bend country. This new line will be 45 miles long.

A telephone Company formed in Matagorda County, Tex., has had the route surveyed between Bay City and Old Matagorda, Tex., and will build a telephone line between the two places. The distance is 20 miles.

The Central Union Telephone Company of Findlay, O., is rebuilding its telephone plant and when completed it will be the finest telephone system in the State. The improvements being made will cost \$50,000.

The Columbia Telephone Line is being extended from Elizabethtown to Bellaire, Pa., on the Cornwall & Lebanon Railway, thus to connect Bellaire with Lebanon.

The lower House of the Massachusetts Legislature refused to place telephones and telegraphs under State supervision.

# TELEPHONE INCORPORATIONS.

The South Suburban Telegraph and Telephone Company of New York—to carry on a general telephone business. Capital stock \$250,000.

The Greenbrier & Organ Cleve Telephone Company, Ronceverte, W. Va. Capital stock \$50,000. Incorporators: M. A. Gates, J. H. Crawford, R. A. Level, B. F. Mann, A. E. Johnson, all of Ronceverte.

The Wilton Telephone Company, Wilton, N. H. — to construct and operate a telephone system. Capital stock, \$2,000. Incorporators: G. F. Bales, C. E. Higgin, W. I. Durgin, J. F. Frye, H. L. Emerson, all of Wilton.

The Deshler Telephone Company, Deshler, O.—to construct and operate a telephone system. Capital stock \$10,000. Incorporators: F. D. Prentis, O. Higgins, H. C. Meeker, J. C. H. Elder, S. Cottingdam.

The Roane County Telephone Company, Kingston, Tenn. Capital stock, \$2,500. Incorporators: J. A. Erwin, J. E. George, T. L. Peterman, T. A. Wright, G. M. Peterman, G. W. Cooper all of Kingston.



# GENERAL NEWS.

# What is Going On in the Electrical World.

#### LIGHTING.

Akron, O.—The Nerthern Ohio Traction Company will erect an electric light plant to cost about \$100,000. H. A. Everett, president, 2573 Euclid avenue, Cleve-

Antioch, Ill.—The city council is discussing th question of building an electric light plant.

Atlanta, Ga.—An ordinance granting the Atlanta Railway & Power Company the use of the streets for an electric lighting system to cost about \$450,000, for both public and private use, was adopted recently by the council. E. Woodluff is president.

Bismarck, N. D.-H. C. Rubd has secured the contract to erect a new electric light plant for the Hughes

Colina, O —The citizens recently voted in favor of putting in an electric light plant and to issue \$25,000 bonds to pay for it.

Chattanoogs, Tenn.—The power house of the electric light plant here was partially destroyed by fire a short time ago, entailing a loss of about \$10,000.

Chicago, Ill.—Half a million dollars is to be expended by Swift & Co. in instituting a new electric light plant to serve their entire holdings at the stock

Clarendon, Ark.-The Clarendon Electric Light & Ice Company, with a capital of \$10,000, was recently in-corporated here for the purpose of erecting an electric light and ice plant. J. S. Thomas is president.

Cloverport, Ky.—This city is prepared to grant a franchise for the construction of an electric light plant. Address T. C. Tousey, clerk.

Fiskdale, Mass.—Mr. Sprague, an electrician from Boston, has been surveying the land here and making arrangements for the electric lights.

Gallatin, Tenn.-This place is to have electric lights in a short time.

Greenspring, O.—The citizens of this place are agitating the question of erecting an electric light plant.

Hallettaville, Tex.—Bids will be received until June 13 for furnishing a 60 kilowatt generator. Address J. W. Hawkins, city secretary.

Hammond, Iad.—The municipal electric light plant

of West Hammond was totally destroyed by fire a short time ago.

Heyworth, Itl.—A Chicago concern is figuring on installing an electric light plant at this place.

Houston, Tex.—J. O'Bierne has been awarded the contract to erect the municipal electric light plant in this city for \$99.750.

Kalama, Wash.—H. M. Stevens and W.F. Yeck, who are operating the Darnell mine, have made application to the city council for a franchise to operate an electric light plant here.

Montgomery, Ala.-The city council has instructed the city engineer to investigate the advisability of the erection of a municipal electric light plant.

Morrisburg, Out.—A by-law to authorize the council of the corporation of this village to acquire water privileges from the Dominion Government to construct electric light and power works and borrow \$250,000, for such purposes, by issuing debentures, was voted on here a short time ago, resulting in a large majority in favor of the by-law.

Nashville, Tenn.—This city will hold an election on lovember 6 to decide the issuance of \$150,000 of bon's or the erection of a municipal electric lighting plant. for the erection of a J. M. Head, mayor.

Neoga, Ill.—The town authorities are discussing the question of building a municipal electric lighting

Salem, Ore.—The city council has granted Franklin R Auson a franchise to establish an electric light and steam heating plant here.

Shakopee, Minn.—This city has voted to expend \$12,000 for an electric light plant.

Shawano, Wis.—The city council has voted to erect

an electric light plant.

Sterling, Ill.—P. J. Jones was recently awarded the contract to build an addition to the electric light plant at this place.

Talladega, Ala.—This city will erect an electric light plant. Address the mayor. Vacaville, Cal.—The Yuba Electric Power Company -This city will erect an electric light

has filed with the board of supervisors of Solano an application for an electric light and power franchise in this place.

Waitsburg, Wash.-The electric light plant here is soon to be enlarged.

Waterville, N. Y.—At a recent meeting of the citizens a resolution was passed recommending that the board call a special election to allow the citizens to vote for an extra appropriation for more electric

Weiser, Idaho — George Nixon, of Spokane, has scured a franchise to put in an electric light plant at

#### STREET RAILWAYS.

Camden, N. J.—It is reported that the new managers may extend the Camden, Gloucester and Woodbury Electric Railway to Pitman Grove, Glassboro and Clay-

Catskill, N. Y.—A trolley railroad is contemplated between here and Albany, along the river, connecting this place, Athens, Coxsackie, New Baltimore, Coeymans and Albany.

Cameron, Mo. — J. Williams of Fountain district is prejecting the building of an electric street railway from this place to Kansas City.

Clifton, O.—There is talk of an electric line starting at Osborn and running through Yellow Springs and this place to Jamestown.

Dayton, O.—The Dayton & Northern Traction Company of this city was recently incorporated for \$450,000 by J. E. Lowes, J. E. Feight, E. Bimm and W. B. Gebhart for the purpose of building and operating an electric railway between here and Greenville through Brookville and Arcanum.

Elizabeth, N. J. - Henry H. Isham is the prime mover of a suburban trolley line to run through the eastern section of this city where there are now no trolley facilities.

Fairmont, W. Va—A company composed of capitalis's from this city and Wheeling basarranged for building an electric street railroad here. About \$100,000 has been subscribed.

Greenwich, Conn.-It is understood in railroad cir-Grenwich. Conn.—It is understood in railroad circles that the New Haven road will purchase the franchise held by Judge B. Jay Walsh of this place for an electric road, and will shortly commence the construction of a trolley that will run through here and consect with Stanford. nect with Stamford.

Lansing, Mich.—Hon. H. R. Pattengill of this city is interested in the proposed electric railway which is to to be built between this place, St. John's, Alma and St. Louis.

Lyons, N. Y.—Calvin Hotchkiss and James D. Bashford are the promoters of the Lyons & Sodus Point Electric Railroad which is to be built this summer.

Pittsburg, Pa.—Several trolley lines in this State will be consolidated so as to form a system of 80 miles between Fairchance and this city. The consolidated road will be used largely for coke traffic.

Pottsville, Pa.—The Pennsylvania Railroad Company has decided to build a trolley road from here to Prim-rose and beyond Minersville to Forestville, a distance of 12 miles.

Rochester, N. Y.—An electric railroad is to be built between this city and Buffalo. Work will be com-menced upon it about July 1.

Springfield, Mass — A plan is maturing which may result in the establishment of a continuous electric street railway system from this city to Palmer by way of Wilbraham.

Tacoms, Wash.-It is stated that bonds to the amount of \$1,000.000 have been floated for the building of the Seattle Tacoma interurban electric line which is to be about 32 miles in length. Judge Bucey is promoter and general manager.

Wapakoreta, O. — The commissioners of Auglaize County lately granted a franchise to F. S. Carpenter, L. M. Coe and J. Mayer, capitalists of Cleveland, to construct an electric railway through the county from Cridersville to this city, thence west to St. Mary's, New Bremen and Minster.

Whitby, Ont.—A company has been organized here for the purpose of building a local electric railway and also to generate electric power. The capital is placed at \$30,000.

# MANUFACTURING.

Chicsgo, Ill.—The Electromote Company was recently formed here to manufacture and deal in electrical devices, etc. W. Clyde Jones, Keene H. Addington and Curtis B. Camp are all interested in the concern

Saco, Me. — The Springfield Electrical Manufacturing Company was recently organized here for the purpose of manufacturing and dealing in electrical apparatus and supplies, with \$10,000 capital stock. The officers are: president, Herbert E. Bosworth; treasurer, Bentley C. Starr, both of Springfield.

# COMPANY MATTERS.

Altoons, Ps.—A new electric light, heat and power company has been organized here recently with \$1,000,000 capital stock.

Hartford, Conn.-Important improvements are under Hartford, Conn.—Important improvements are under consideration at the works of the Billings & Spencer Company. The increase of the company's business has made it necessary to colarge the plant by increasing the motive power. It is maintained that the power can be divided and distributed more economically among the several departments if electricity is used than is the case with the steam power as used at present.

Irwin, Pa — The Irwin Electric Light & Power Company, the Jeannette Electric Light Company and the Manor Electric Company have been sold to Greensburg capitalists, headed by E. E. Robbins and M. L. Painter, for \$175 000.

Johnstown, N. Y. - The Fulton County Gas & Electric Company, a new corporation with a capital of \$1,500,000, has absorbed all the gas and electric companies in this county, namely: The Johnstown & Gloversville Gas Company, capital \$130,000; the Johnstown Electric Light & Power Company, capital \$100,000; and the Gloversville Electric Company, capital \$75,000.

Key West, Fla.—The Key West Electric Company will install new machinery. J. P. Loflin, president, No. 26 Broad street, New York.

No. 26 Broad street, New York.

Syracuse, N. Y.—The board of directors of the Marvin Electric Drill Company, which manufactures electric rock percussion drills, has voted to sell its German patents to a large German manufacturing concern. The drill company has a plant at Canastota and a number of men from this city are stockholders.

New York City.—J. H. Bunnell & Company of this city, manufacturers of and dealers in telegraph instruments and other electrical supplies, has lately placed its patent business in charge of David E. Lain, patent attorney, of Middletown, N. Y.

St. Louis, Mo.—The Commercial Electrical Supply Company of this city has increased its capital stock from \$30,000 to \$60,000.

# POWER AND TRANSMISSION PLANTS.

Indian Orchard, Mass.-H. S. Anderson, of the Indian Orchard, Mass.—H. S. Anderson, of the United Electric Light Company, is starting a concern to utilize the water power of the Chicopee River below here, and this company will be known as the Bircham's Bend Power Company, which will be capitalized for \$100.000. This power can be transmitted to Chicopee by means of wires, and can be used for running engines in various manufactories. in various manufactories.

Knoxville, Tenn.-A bill has been introduced in Knoxville, Tenn.—A bill has been introduced in Congress by Representative Henry R. Gibson, to grant the Knoxville Power Company the right to dam the Tennessee River at or near this city. This bill may be passed in Congress at present session, and in that event the company will begin putting its scheme into effect next fall. R. W. Austin, one of the incorporators, recently said: "New York capitalists have agreed to put their money in the project just as soon as we perfect all arrangements. If the scheme goes through the plant will cost \$800,000."

Post Fells Idaho.—P. K. Neill is the presents of a

Post Falls, Idaho.—R. K. Neill is the promoter of a proposition to erect a \$500,000 electric power plant here to furnish power for the operation of the mines in the Coeur d'Alene country. Wires will be strung for 65 miles, or as far as the town of Burke, Idaho. By this plan some of the largest mines in the Coeur d'Alene will be operated by electricity.

Pughtown, Pa.—By damming French Creek, near here, power is to be secured for a plant for supplying electricity for commercial purposes in the French Creek and Schuylkill Valleys.

Rock Hill, S. C.—The Catawba Power Company was recently organized with W. G. Wylie of New York president. The company is capitalized at \$100,000, and will put in an electric plant on the Catawba River near here. The company will furnish light and power to the surrounding towns.

South Windham, Me.—A new electric power plant is to be established at Mallison Falls.

# MINES.

MINES.

Leadville, Col.—Another electric power plant has been projected to supply power for the Leadville mines. John J. Hill and E. P. Young of Denver have been locating ground and water rights on Upper Homestake Creek above Gold Park, Esgle County. Two lakes on the headwaters of Homestake Creek have been located, and part of the water rights taken up. Preliminary surveys were made by Ben L. Crees. His plan is to dam the water at the outlet of the two lakes, and thus form storage reservoirs for the volume of waters that pours into these lakes in the spring. The water will be conveyed in pipes to Go'd Park, where the power plant will be located. The electric current will be conducted to this place across the mountain, a distance of 12 miles in an air line.

# AUTOMOBILES.

Boston, Mass.—A company known as the Boston Woods Motor Vehicle Company will conduct a selling business in addition to its cab and delivery wagon service, and is understood to have made arrangements to vice, and is understood to have made arrangements to locate its central station on Eliot street. The plans of the company include the establishment of recbarging stations at convenient points through the suburbs, where electricity will be supplied to its own carriages or sold to electric vehicles of private ownership. It also gives promise of great things in the line of an electric express business for suburban collections, and is looking to the aventual establishment of a regard less than the control of the control of the stablishment of a regard less than the control of the stablishment of a regard less than the control of the stablishment of a regard less than the control of the stablishment of a regard less than the control of the stablishment of a regard less than the control of the stablishment of a regard less than the control of the stablishment looking to the eventual establishment of a special electric carriage service in connection with the railroad terminals.

Chattanooga. Tenn.—S W. D.vine, president of the Chattanooga Rapid Transit Company, is conducting negotiations with a view of organizing an electric motor vehicle company, for operating all manner of electrical vehicles 

It is the intention of the company its charter to put motor vehicles in any or all the counties.

Painesville, O.—The Painesville Automobile Company was organized here a short time ago with a capital stock of \$10,000.



# **ECTRICAI** SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electricity from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; cell., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gon., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mkg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

# STOCKS.

PASSE	N	ER F	RAILW	AYS.			PASSENGER RAILWAYS.						
•		Capital	Stock.						Capital	Stock.			
FAME:	Par	Authorz'd	Issued.	Rate and Date of Last Div.	Bld.	Asked.	NAME.	Par	Authorz'd/	Issued.	Bate and Date of Last Div.	Bid.	Aske
Albany, N Y June 4. United Traction.		<b>9</b> 5, <b>000,00</b> 0	<b>\$5</b> 000,000	1 <b>% % Q.</b> ,	124	125	Hartford Conn.—June 4: Hartford Street Ry. Co Hartford & West Hartford RR		\$4,000,000 1,000,000	\$200,000 247.000	3 % S., Oct.,	150	=
(Consolidation of the Albany and Troy City Railway.)							Holyoke Mass.—June4. Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	2073	212
Allentown Pa.—June 4:							Hoboken, N. JJune 4.						
Allentown & Lebigh Val. Trac. Co		4,000,000	1,500,000	•••••		15	North Hudson Co. (N. J.) Ry. Co	25	1,250,000	1,000,000	8 X,	150	-
Bridgeport, Conn—June 4: Bri igeport Traction Co	100	2,000,000	2,000,000	1 <b>% ∆ug.,</b>	105		Indianapolis, Ind-June 4.  Indianapolis Street Ry	ļ	5,000,000	5,000,000	•••••	24	24 %
Baltimore Md.—June 4: a United Rail ways & Elec. Cocom.	50	24,000,000	18,000,000	***************************************	181/4	181/2	Lancaster, Pa.—June 4 Pennsylvania Traction Co Lancaster & Col. Electric By		10,000,000	9,900,000 87,500			=
BOSLON. MASS.—June 4 New England Street By	100 50 50	4,000,000 2,000,000 10,000,000	4,000,000 2,000,000 9,085,000 6,400,000	1 % Q., Jan.15, 6 % S., A. & O. 3% % S., Oct., 's9. 4 % S., Jan. 2% % Aug. 99,	15 85 93 112 139	16 87 94 114 140	West End Street RallwayLouisville, Ky.—June 4: Louisville Rycom. Louisville Rypfc Minneapolis, Minn.—June 4	100	4,000,000 2,500,000	8,500,000 2,500,000	1½ %., April. 2½ % 8., Oct. 1,	78 110	79
Brooklyn N. YJune 4: Brooklyn City Ry	100	43,000,000 200,000	200,000 12,000,000	3% % Q., Jan.,	229 690, 107 207	250 6934 109 289	Twin City Rapid Transitcom Twin Oity Rapid Transit7% ptd Montreal, Canada.—June 4 Montreal Street Ry. Co			1,712,200	13/4 %, Oct.  8 % S., M. & N.  13/4 % S., J. & J.	688/1 186 760 1008/4	187 261
aBrooklyn, Queens Oo. & Sub. RB. Coney Island & Brooklyn RB. Kings County Elevated Eings County Traction Co Kassau Electric Railroadpfd. /Atlantic Avenue Railroad	100	4,750,000 4,500,000 6,000,000 2,000,000	1,884,200 4,750,000 4,500,000 6,000,000 2,000,000	1 % July	320 75	825  80	Memphis Tenn.—June 4: Memphis Street Railway Co New Haven, Conn.—June 4: Fair Haven & Westville RR.	20		2.000.000	8 % S., Pept.	25 89	- 41
eBrooklyn, B. & W. E. Railroad  Buffalo N. Y.— June 4: Buffalo & Niagara Falls Elec. By  Buffalo Railway Co	100	1,250,000	1,250,000		74 99	75 100	New Haven & Centerville	100	700,000	1,000,000 800,000	2½ % A., July	45	46
Columbus O.—June 4: Oliumbus Street Railroad Columbus Street Railroad, pfd	100 100			1 % Q., Feb.	25 88	28 88	Canal & Claiborne RR. Oo	1 100	1,200,000	2,000,000	14 % S., July, 11 % % Q., Oct.	148 % 22 % 95 20 %	94 96
Charleston, S. C.—June 4 Charleston City By. Co	50 25	100,000 1,000,000		8 % S.		::	bNew Or. City & Lake RBguar Orleans Raliroad. St. Charles Street Railway New YOPK—June 4:	50	2,000,000 500,000	2.000.000	4 % S., Jan., 1½ %., June, 1½ %. Oct.,	5614	52
C 11cago, Ill.—June 4 Chicago City Ry. Co	100 100 100 100 100 100 100	10,828,800 10,000,000 15,000,000 15,000,000 10,000,000 2,000,000 2,000,000 1,250,000	10,828,800 10,000,000 7,600,000 9,000,000 6,600,000 249,900 1,603,200 18,189,000	Feb 28 1900.  8 % Q., Jan.  11% % Q., Feb.  35 %	252       	28 8014 215	Central Crosstown RR cChristopher & 10th Sts. RRguar Dry Dock, E. Brdw'y & Battery RR dMetropolitan Street Ry. Co eBleecker St. & Fulton Fy. Ry. guar fBroadway & Seventh Aveguar gOen. Park, N. & E. Rivers RR. guar hEighth Avenue RR 142d St. & Grand St. Ferry RR. guar	100	750,000 800,000 2,000,000	748,000 800,000 2,000,000	2½, % Q., Oct., 2½, % Q., Oct., 1½, % Q., Nov., 1½, % Q., Feb., 1900 ¾, ¼ A., July, 2½, % Q., 1¼, % Q.,	270 178 100 165 \( \) 85 230 99 895 895 198 203 400	800 18434 125 15534 87 240 201 400 410 205 210 4(5)
Cincinnati, Ohio.—June 4: Cincinnati Inc. Plane Bycom Cincinnati Inc. Plane Rypfd. Cincinnati, Newport & Cov. St. Ry. iCincinnati Street By. Co Mt. Adams & Eden Park Inc. Ry.	100	180 000	150 000	% % Feb. 2% % Feb. 1% % Q., Jan. 1% % Q., Jan.	75 124 \		Second Avenue RR. Third Avenue RR. *M2d St., Manhatv'le & St. Nich. Av *Union (Huck) *berry) Ry.  Newapk N. J.—June 4: Consolidated Traction Co. of N. J.	100 100 100 100	2,500,000 12,000,000 2,500,000	1,862,000 10,000,000 2,500,000 <b>2,000,00</b> 0	2 % Q., Jan,, \$1.75 p. sh. Feb.	198 118 10 190	201 11£1/2 60 200
Cleveland, Ohio June 4: Arron, Bed. & Olev. Riec. Ry. Oleveland City Ry. Cleveland Electric By.	100	1,000,000	1,000,000 7,600,000	<sup>3</sup> / <sub>4</sub> % Jan. 3-5 % Jan. <sup>3</sup> / <sub>4</sub> % Q., Oct., <sup>1</sup> 99.	48 100	50 101 8754	North Jersey Street Rallway Co United Electric Co. of New Jersey Pittsburg, Pa.—June4: Allegheny Traction Co	100 100	6,000,000 504,000	6,000,000 504,000 500,000	11% % A.	27 28 <del>/</del> 56 26	56
Detroit, Mich.—June 4: Detroit Ottisens' Street Ry	100	250,000 1,000,000	1,200,000 250,000 1,000,000	************	1003/ 175 90	i00 i10	Consolidated Traction Copfd   pCentral Traction Co   qCitizens Traction Co   rDuquesne Traction Co   sPittsburg Traction Co   Federal St. & Pleasant Valley Rv	50 50 50 50 50	9,478,850 1,500,000 8,000,000 8,000,000 2,500,000 1,400,000	9,000,000 1900,000 18,000,000 18,000,000 1,900,000 1,400,000	8 %, Nov. 1% % Nov. 6 % A. 6 % A. 6 3/ %, Nov.	1234 69 1234 27	70
Dayton O.—June 4: City Railway Cocom. City Railway Copfd. People's Street Railwaypfd.	100	1,500,000	1,470,600		140 170 114	145	Pgh., Allegheny & Man. Trac. Co Pitsourg & Birmingham Trac. Ry. Pitsburg & West End Ry. United Traction Cocom United Traction Copref.	50 25 50 50	8,000,000 1,500,000	1,500,000 8,000,000 17,000 000	2%, Aug. 1%, Oct. 5% A., June	41 14 513/4	123x

\*Unlisted. † Ex div.
a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co of Baltimore. The pref. stock of U. R & E'ec. Co. has been issued in the form of income bonds.
b Leased to Boston Elevated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
d Stock owned by Kings County Traction Company; road operated by Brooklyn Hts. Co.
f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
g Owned by Atlantic Ave. RR and leased to Nassau system.
A 300 per share on outstanding capital pa'd as rental by lessee—West Chicago St. RR. Co.;
250,100 of stock owned by North Chicago Street Railroad Company.
d Controls by lesse Chicago West Division Railway, Chicago Street Railway, and
West Chicago Street Railroad Tunnel Company.
f 55 y per annum paid on outstanding capital as rental by lessee—North Chicago Street
Bailroad Company; 525,100 of stock owned by West Chicago Street Railroad Company.
h Majority of stock owned by Chicago West Division Railway Company; 5 % on \$1,000,000 to the Chicago Street Railway Company; 5 % on \$1,000,000 to the Chicago Street Railway Company; 5 % on \$1,000,000 to the Chicago Street Railway Company; 5 % on \$1,000,000 to the Chicago Street Railway Company, 1000 to the Chicago Street Railway Company, 1000 to the Chicago Street Railway Company, 1000 to the Chicago Street Railway Company, 1000 to the Chicago Street Railway Company, 1000 to the Chicago Street Railway Company, 1000 to the Chicago Street Railway Company, 1000 to the Chicago Street Railway Company, 1000 to the Chicago Street Railway Company, 1000 to the Chicago Street Railway Company, 1000 to the Chicago Street Railway Company, 1000 to the Ch

Unlisted. † Full paid. | Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
c Leased to New Orleans Traction Company at 8 % on stock.
c Leased to Central Crosstown Ratiroad at 8 % on stock and interest on bonds.
d Operating the former Med. Trac. system, that corporation having become extinct.
c Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Ry.
f Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.
i Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.
i Leased to Metropolitan Street Railway for 18 % on stock.
i Leased to Metropolitan Street Railway for 18 % on capital stock.
Controlled by Third Avenue Railway for 18 % on capital stock.
Controlled by Third Avenue Railway for 18 % on capital stock.
Outrolled by Third Avenue Railway for 18 % on capital stock.
Controlled by Third Traction Company for 8 % per annum on par value of stock.
I Leased to Consolidated Traction Company for 8 % on s3,000,000 capital stock.
I Leased to Consolidated Traction Company for 6 % on s3,000,000 capital stock.
I Leased to Consolidated Traction Company for 6 % on capital stock.
I Leased to Consolidated Traction Company for 6 % on capital stock.
I Leased to Consolidated Traction Company for 7 % ee capital stock.

# PASSENGER RAILWAYS.

# TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Authorz'd		Bate and Date of Last Div.	Eid.	Asked.	NAME.	Par	Authorz'd	Stock.	Bate and Date of Last Div.	Bid	Aske
New Bedford Mass-June 4	100	\$850,000	\$850,000	2 %, Feb.	160	165	Boston, Mass.— June 4 American Bell Telephone Co	100	50,000.000	28,650.00	1 % Q., Jan. 1 % Q., Feb. 20,	305	1
orthampton, Mass-June 4				4 % A., June.	170	178	Erie Telegraph & Telephone Co New England Telephone Co	100	10,894,600	10,804,60	1 % Q., Feb. 20, 81.50 p. sh. Feb	183	102
naha, Neb June 4:		5,000,000	5,000,000	3 % A. and N.	55	65	New York.—June 4 American Telegraph & Uable Co *Central & South Am. Teleg. Co	100	14,000,000	14,000,00	1½ % Q.	91 104	94
terson N. J June 4		1,250,000	1,280,000	***********	54		Franklin Teleg. Co2½ % guar Erie Telegraph & Telephone Co	100 100 100	10,000,000 1,000,000 5,000,000	10,000,00	11/ % Q 11/ % Q. 11/ % Q. 11/ % Q. 11/ % Q. 11/ % Q.	165 42 112	170 52 118
ovidence, R. IJ une 4:		8,000.000	8,000,000	3/4 %, Oct. 198	109	111	*Gold & Stock Telg. Coguar. 6 %  *International Ocean Tel Co.guar 6 % Mexican Telephone Co	100 100 100	5,000,000 8,000,000 2,000,000			118 116 2	128
iladelphia. — June 4 rmount Park Trans. Co \$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '19.	28	24	*New York & New Jersey Tel. Co *Pacific & Atlantic Telegguar. 4 % *Postal Telegraph Cable Co	25 100	2,000,000	8,728,000	2% % Q., Jan., '99. 2 % 8. 1 % Q.	168	21/2 174 75
stonville, Man. & Fairmount st'nvl'e, Man. & Fairm't6 % pfd. Fairmount Pk. & Had. Pass. Ry.	50 50	800,000	800,000	2% %, July 15, '59. 8 % S—July, '99. 8 % Feb. 1, '59.	47 75 75	48 76 76	*Sout'n & Atlantic Telg. Co.guar. 5 % †Commercial Union Telegraph Co Western Union Telegraph Co	25	950,000 500,000	559,528 500,000 97,870,000	1 % Q. 2% % S. 8 % S., Jan., '99. 1% %, Q, Jan. '99.	95 115 795	8 79
lon Traction Co \$12½ pd Electric Traction Co	50 50		8,297,920 †192,500	93 share Q.	39 845	39 %	†Div. guar. by Postal Teleg. Co. Miscellaneous. – June 4:						
Frankford & Southwark Pas. R Lehigh Avenue Ry. Co Lombard & South Street Ry	50 50 25		1 000 000	\$14 sha'e A—Apr. \$9 A. & O.	48 90	451 901/4	American Dist. Teleg. (Phila.) Bell Teleph. Co. (of Canada.) Chesapeake & Potomac Telep. Co	100		8,561,000	1 % Q. 2 % 8.	26 188 61	66
dSecond & Third Streets Ry People's Traction Co gGermantown Passenger Ry	50 50 50	10,000,000	†771,078 †6,000,000  572,800	\$9 share A, Mar. 98 8 %, A., April, '98. 85.25 share—1898.	150	151	Chicago Telephone Co Central Dist Prig & Telg.Co.(Pgh.). Empire & Bay States Telegraph Co.	100 100	750,000	750,000		200 148	210 150 80
APeople's Passenger Rycom.	50 25	500,000 1,500,000	740,000	8 % Jan., 1898.	151	152	Hudson River Telephone Co *Northwestern Telegraph Coguar	100 50	2,000,000 2,500,000	2,000,000	1 % Q. 23/4 % Q.	79 120 122	125 125
hPeople's Passenger Rypid. Philadelphia Traction Co	50 50		1400.000	\$2 p. sh., Oct. 98. 6 % A—Mar., '98.	96	961/4	Providence (R. I.) Teleph. Co Southern New Eng. Teleph. Co		8,000,000		::::	941	1
Continental Pass. Ryguar Empire Passenger Ry. Co Philadelphia City Pass. Ry	50 50 50	600,000	475,000	\$6 share—July, '98. \$7.50 share July '98.	208	157 208 <sup>1</sup> / <sub>4</sub>	ELECTRIC LIGHT	AN	D ELE	EOTR	IOAL MFG	.0	08
Philadelphia & Gray's Fy. RE	50 50 50		298,650	\$3.50 share July '98	3.834	809	Boston, Mass.—June 4: Fort Wayne Electric trust receipts Ft. Wayne Elec Co. T. Sec. Series A.	25			::::	115	125
iPhiladelphia & Darby Ry.guar. 17th & 19th Sts. Pass. Ry. guar iThirteenth & 15th Sts. Pass. Ry.	50 50	1,000,000	250,000 885,000	\$2 share July, '98. 1½ % S., July, '98. \$11 sh. A., July, '98.	800	240	†General Electric Co. [old] com. General Electric Co. [new] " TH. Elec. Co. T. Secur., Series D.	100 100	40,000,000 18,276,000	80,460,000 18,276,000	2 % Q., Aug., 1898. 1% % Q., Jan., 1900	185	185
iUnion Passenger Ry. Co iWest Philadelphia Pass. Rv	50 50	1,500,000 750,000	750,000	89.50 shre, July '98 \$10 share, July '98	262	268	Westinghouse Elec. & Mig.Co.com. Westinghouse El. & Mig. Co. pid.	50 50	4,000,000	146,700 8,996,058	1% % Q., Jan.,	48 61	45 62
ochester, N. Y June 4	100	5,000,000	5,000,000	,,,,,,,,,,,,,	16	17	New York.—June 4:		11,000,000	8,195,126	-1	42	-
eading, PaJune 4		1,000,000	1,000,000	Semi-an.,Jan. & Jy	24 138	26	Edison Elec. Ill'g Co., New York *Edison Elec. Ill'g Co., Brooklyn Edison Ore Milling Co	100 100 100	9,188,000 4,000,000	7,988,000	1½ % Oct., '98.	119	120
City Passenger Ry East Reading Electric Ry	50	850,000 1,0 <b>0</b> 0,000	\$50,000	Jan., '98. Jan., '98.	70	**	tGeneral Electric Co. [old]com. General Electric Co. [new]				2 % Q., Aug., 1898. 1½ % Q.,Jan., 1900.	82	92
. Louis MoJune 4. urth Street & Arsenal Ry Terson Avenue Ry. Co	50 50	800,000 400,000	150,000	2 % Dec. 1888.	:	::	Interior Conduit & Insulation Co Kings Co. El. L. & P. Co	100 100 100	1,000,000	1,000,000	****	41 110	1351
tional Railway Oo Sass Avenue & Fair Grounds	100	2,500,000 2,500,000	2,400,000 2,479,000	2 % Dec., 1888. 1¼ % Jan., '99. 1½ % Jan. '99.	::	::	Pittsburg, PaJune 4 Ulegheny County Light Co	100	500,000	500,000	J. & J.	168	172
itizens' RR	100 100	2,500,000 2,000,000 2,000,000	2,500,000 1,500,000 2,000,000	4 %, Oct., '98. 2½ %, Jan., '99. 1½ % Jan., '99.	::	::	Philadelphia, PaJune 4	50	800,000	800,000	Q	-	-
ssouri RR  ople's RR. Co  itad Electric Rvcom.	50 50 50	2,400,000 1,000,000 500,000	2,800,000 800,000 500,000	50c., Dec., 89.	201/4	21	Edison Electric Light Co *Electric Storage Battery Cocom.	100 100	2,000,000 8,500,000			144 80	1443
ited Electric Ry 8 % prei.	100	1,000,000	1,000,000	3 %, Jan., '99.	69 68	71 70	*Electric Storage Battery Copfd. Northern Elec, Light & Power Co Southern Elec, Light & Power Co	10	5,000,000 550,000 187,500	550,000 187,500		80 13 80	90
n Francisco CalMay.		10.000		8 % A., July, '19			Miscellaneous June 4:		500,000			47	48
ilifornia St. Cable RRary Street Park & Ocean RRrket Street Ry	100 100 100	1,000,000	375,000	50c. monthly. \$2.50 share, '96. Q., 60c. per share.	117 50 61½	681/4	Bridgeport (Conn.) Elec. Lt. Co Missouri-Edison (St. Louis)com. Eddy Electric Mig. Co	25				20 10	21
esidio & Ferries RR	100	1,000,000	550,000		••	16	Missouri-Edison (St. Louis)com. Eddy Electric Mfg. Oo Hartford (Conn.) Elec. Light Co Hartford (Conn.) Lt. & Power Co New Haven (Oonn.) Elec. Lt. Co Narragansett (Prov., R.I.) Elec. Co. Bhode Island Elec. Protec. Oo Toronto (Canada) Elec. Light Co Thomson, Houston Welding Co	25 100	850,000 175,000 100,000			150 6 195	155
ranton Railway Co	50 100	6,000,000 500,000	500,000	*****************	29 16½	80 -	Narragansett (Prov., R.I.) Elec. Co.  Bhode Island Elec. Protec. Co	50 100	1,200,000		2 % Q., Oct.,	98 118¼ 201	100 120 202
princfield Ill.—June 4:	100	1,050,000	1,050,000	***************************************		••	Thomson-Houseon werang commi	100		1,085,000	154 % Q 8 % 8, Dec. 1, 96.	181	1828
ringfield Consolidated By	100	750,000	750,000	***************************************	****	**	Woonsocket (R. I.) Electric Co †On Aug. 17 last by a majority vot to \$20.827,200, of which \$18,276,000 is of	100	the stock	nolders 11	a canital stock we	105 s red t Ex	106 luced
ringfield Street By Pringfield, MassJune 4.	100	1,000,000	1,000,000	***************************************		11	to \$20,827,200, of which \$18,276,000 is on the Edison III pany, the Municipal Electric Light	umir Co.	nating Co.	of Brook	lyn and its constit	uent	com
ringfield Street Ry	100	1,200,000	1,166,700	8 % A.	207	212	ALLIE	D	NDUS	STRIE	S.		_
ronto Street Ry	100	6,000,000 4,000,000			100 260	100½ 261	Boston MassJune 4: American Electric Heating Co	50 100	10,000,000	1 040 800	90 - ab Tan 05 100		-
ashington, D. C June 4:	50	500,000					Street Ry. & Illu'g Propertiespfd United Electric Securities Copfd.		4,500,000	1,000,000	\$2 p. sh. Jan, 26, '99 \$8.50 p.sh. Nov '99.	-	100
lt Ry. Co	100 50	112,000,000 400,000	12,000,000	65c. per sh, Oct. 19.		105	New York June 4:					1	
kington & Soldiers' Home Ry ergetown & Tenallytown Ry tropolitan RR. Co	50 50 50	707,000 200,000 1,000,000	200,000	2½ % Q.	35 15	40 16	Consolidated Electric Storage Co Safety Car Heating & Lighting Co Worthington Pump Cocom.	100			****	8 150	12 155
orcester, MassJune 4.	100				81	32	Worthington Pump Copfd Philadelphia PaJune 4	100 100	5,500,000 2,000,000	5,500,000 2,000,000	7 X A	109	110
Vorcester Traction Cocom. Vercester Traction Co6 % pfd. Vercester & Suburban Street Ry	100 100	2,000,000	2,000,000	8 % S., Feb., '98. 4½ %, 1897.	104%	106 85	Electro Pneumatic Trans. Co United Gas Improvement Coscrip.	10 50	1,500,000			27/8	8 162
Vilkesbarre, Pa.—June 4 likesbarre & Wyoming Val. Trac	100	5,000,000	5,000,000	1%, Jan.,	25	29	Welsbach Commercial Cocom.	100	8,500,000 500,000		2 % Q	20 73 43	21 75
* Unlisted. † Paid in. ‡ Full a Leased to Hestonville, Man &	Fair	rmount Po	aggenger H	v for 6 % on stook	per a	nnum.	Welsbach Light Co Welsbach Light Co., Canada Pittsburg, Pa.—June 4:	5	525,100 500,000			134	13/8
b Consolidation Electric, Peopharges and all indebtedness of correction Company.	ple's onst	and Ph	iladelphia d leased	Traction companies assume	ies.	Fixed	Carborundum Mig. Co	100 196	200,000 1,000,000	200,000 1,000,000		190	192
c Practically all shares owned by d Lease to Frankford & Southwas Leased to Electric Traction Co	ark	Passenger	tion Comp r Ry. assu	oany. med by Electrie Tr	action	n Co.	MiscellaneousJune 4:	100		1,000,000		141/4	
f Controlled by Frankford & G g Leased to People's Passenger h Majority of stock owned by F	outh	wark Pass	enger Rai	lway.			*Barney & Smith Oar Copid. Billings & Spencer Co Consol. Car Heating Co	100 25		2,500,000		104 82	107
4 Leased to Union Traction Con	nagr	V.					Johns-Pratt Co	100 100 100	1,250,000	1,250,000	1% % Feb	55 105 2	58 109 4
, ment - manufactured to Union II		anvat a	rental of	\$10,000 per annum	in 1	866-7-8	*Pratt & Whitney Copfd	100				40	50
j Lease transferred to Union Tr J Leased to United Traction O. p.a. \$20,000 in 1899-1900 and \$30,000 declared as a dividend semi-annua & Dividend of 10 % guaranteed Dividend of 6 % guaranteed b Leased and operated by the Se	per	annum th	ereafter,	payable semi-annu	ally,	rental,	Stillwell-Bierce Cocom.	**	*********	****	% Sept 1,'99.	70	60 65

\*\*Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at \$5 per share.

h Majority of stock owned by People's Traction Company.

Lease transferred to Union Traction Company.

| Leased to Union Traction Company.

| Leased to United Traction Company at a rental of \$10,000 per annum in 1866-7-8

| Leased to United Traction Company at a rental of \$10,000 per annum in 1866-7-8

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| Leased to Union Traction Company at a rental of \$10,000 per annum in 1866-7-8

| Leased to Union Traction Company at a rental of \$10,000 per annum in

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# BONDS.

PASSENGER RAILWAY.						PASSENGER RAILWAY.					2		
NAME.	Amor		Due	Interest periods.	Bid.	Asked.	NAME.	Ame Authorized.		Due	Interest periods.	Bid.	-
NABA	1	2004040		portouse	Dia		New Orleans La.	U CENTRAL DE LA CONTRAL DE LA	ADDAUG:	2000	pontous.	Detta	-
Albany N. Y.  Date of Quotation—June 4, 1900 he Albany Ry. CoGen. mig. 5s. The Albany Ry. CoGen. mig. 5s. Watervleit Turnpike & RR. lei mig. 6s. Watervleit Turnpike & RR. 2d mig. 6s. roy Oity Railway Co	8500,000 750,000 850,000 150,000	850,000	1947 1919	M. & N. M. & N. M. & N.	*117½ *117 *125 *128 *116½	119% 127% 127	Dete of Quotation—June 4, 1900. Canal & Claiborne RR. cons mig. 5s. Crescent City RR	5,000,000 418,500 5,000,000 850,000 800,000	8,000,000 899,000 2,599,500 850,000 800,000	1899 1948 1908 1948 1907 1912	M. & N. J. & J. J. & D. J. & J. F. & A. J. & J.	105% 108 112	112 118
Interest guar, by Albany Ry. Co. [Principal and interest guar by bany Ry. Co.							184. Charles St. RR. Co	800,000	75,000	1906	J. & D.		****
Baltimore Md.  Date of Quotation—June 4, 1900							New York.  Date of Quotation—Ju ne 4, 1900						÷
Inited Electric Ry. Colst mig. g. 4s  altimore City Pass. Ry. lst mig. g. 5s.  Baltimore Traction Co is i mig. g. 5s.  Baltimore Trac. Co. Exten. & Imp. g. 5s.  Baltimore Trac. Oo. Exten. & Imp. g. 5s.  Baltimore Trac. Oo. Ooll. Trust, ist mig. g. 5s.  Baltimore Traction Co. Convertible 5s.  Central Pass. Ry. Co Cons. mig. g. 5s.  Central Pass. Ry. Co Cons. mig. g. 5s.  Lake Roland Elev.,	88,000,000 14,000,000 2,000,000 1,500,000 1,250,000 750,000 96,000 96,000 8,000,000 1,000,000	2,000,000 1,500,000 1,250,000 1,750,000	1949 1911 1929 1901 1942 1906 1912 1982 1922	J. & J. N. & M. J. & J. M. & N. J. & D.	102 7434 11876 119 10436 121 101 10236  119 116 117	102¼ 75 120  121¼  121 117	Atlantic Ave. (Brooklyn)Imp. g. 5s. Atlantic Av. (Brooklyn).lstgen.mig.5s. †Atlantic Av. (Brooklyn)Cons.mig. 5s. †Bro'dway & 7th Aveist ons. mig. g. 5s. Broadway & 7th Avelst mig. 5s. Broadway & 7th Avelst mig. 5s. Broadway & 7th Ave2d mig. 5s. Broadway Surface2d mig. 5s. Broadway Surface2d mig. 5s. Brooklyn City RR. CoIst cons. mig. 5s. Brooklyn City & Newtown.lst mig. 5s. (Brooklyn Bath & W.E. RR. Gen.mig. 5s. Brooklyn Heights RR1st. mig. 5s. Brooklyn Heights RR1st. mig. 5s. Brooklyn, Q's Oo. & Sub'n1st mig. 5s.	759,000 8,000,000 12,500,000 1,500,000 500,000 1,125,000 1,000,000 6,000,000 2,000,000 1,000,000 250,000	1,966,000 7,650,000 1,500,000 500,000 1,125,000 1,000,000 6,000,000 2,000,000 448,000 250,000 8,500,000	1909 1981 1948 1904 1914 1924 1905 1941 1989 1988 1941 1941	M. & S. A. & O. J. & D. J. & D. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J.	95 107% 115 128 104 108 115 105 116 115 101 104 112	110 116 125 105 110 117 106 117 116
All of the bonds of the above ompanies, marked †, have been assumed by the United Railways & Electic Company.  BOSTON, MASS.  Date of Quotation—June 4, 1900 Lynn & Boston BRlst mix. g. 58. Fest End Street RyDeben. g. 58. fest End Street RyDeben. g. 4%s.	5,879,000 8,000,000 2,000,000	8,702,000 8,000,000 2,000,000	1902	J. & D. M. & N. M. & S.	114 1041/4 112	115 106	Brooklyn, Q's Co. & Sub'n. Ist cons. 5s. Brooklyn Rapid Transit	1,000,000 7,000,000 1,200,000 250,000 800,000 1,000,000 000,000 200,000 1,500,000	800,000	1945 1900 1902 1922 1908 1982 1914 1914 1910 1915	J. & D. M. & N. J. & J. J. & D. F. & A. F. & A. M. & S. J. & J.	107 109% 91% 107 125 101 117 102 108 116% 82	1: 0) 109 108 120 105
#81,674,000 in escrow to retire outstand- ag bonds of absorbed companies.							Second Avenue Ry. Gen. cong. mtg. 5g	1,600,000	1°,500,000 1,600 000	1997 1909	F. & A. M. & N.	120 120	121
Charleston S. C.  Bate of Quotation—June 4, 1900.			***				Steinway Ry. (L. I.)1st mtg. g. 6s. South Ferry RR. Co1st mtg. g. 6s.	1,500,000 350,000	1,500,000 850,000	1922 1919		10% 116 110%	109 117 112
Interprise Street RR	500,000 850,000	47,000	1906	J. & J. J. & J.	106	****	Twenty-third Street Ry	150,000	150,000 2,000,000	1909 1906 1942	J. & J. J. & J. F. & A	106	128 108 116
Chicago III.  Date of Quotation—June 4, 1900							ttWestchester Electric RR1st mtg. 5s. t\$1,085,000 in escrow to retire gen. mtg. bonds.	500,000	500,000	1948	J. & J.	110	114
Ohicago City Ry	7,500,000 1,500,000 4,040,000 7,574,000 15,000,000 8,171,000	7,500,000 750,000 4,040,000 8,781,200 15,000,000 8,171,000	1908 1929 1929 1907 1982 1928 1942 1906	F. & A. J. & D. A. & O. J. & J. J. & J. J. & J. F. & A. J. & J.	101%  108% 96 106	102  109 	1\$4,850,000 in escrow to retire maturing obligations. 1\$552,000 in escrow to retire 1st and 3d mig. bonds. 2in treasury, \$80,000. 1t Guar. by Union By. Co.  Toronto Canada.  Date of Quotation—Jun. e, 1900. Montreal St. Ry			1908	M. & S.		
forth Chicago St. RR Cert. Indeb. 6s. forth Chicago City Rylst mtg. 6s. forth Chicago City Ryconsol. 4/6s. Vest Chicago St. RR	500,000 2,500,000 4,100,000 2,700,000 12,500,000 1,500,000	500,000 2,500,000 8,969,000 700,000 6,000,000	1900 1927 1928 1911 1986	J. & J. J. & J. M. & N. M. & N. J. & D.	108  101 1065/8	111 102 107	†Toronto St. Ry	850,000	800,000 2,200,000 810,000		M & S.  J. & J. J. & J.	****	
of v. Ry. Co., controlling interest of thich is owned by W. Chicago St. RR. o., lessee. Subject to call after Oct. 1, 1899, at 10 and interest.  Assumed by W. Chi. RR. Co., lessee.  Int. guar. by W. Chicago St. RR. Co.   Cincinnati, O.							Greene & Coales St. Ry	100,000 150,000 250,000 500,000 1,125,000 5,698,210 200,000 1,800,000	250,000 458,000 867,000 200,000 1,018,000 100,000	1901 1905 1911 1912 1948 1910	J. & J. J. & J. M. & S. J. & . F. & . A. & O		
in. New. & Cov. St. By. 1st Con. mtg. g. 5t Mt. Adams & Eden P'k In 1st mtg. 5s. Mt. Adams & Eden P'k In 1st mtg. 5s. Mt. Adams & Eden P'k Inc. Cons. mtg. 5t. 0. Cov. & Cin. St. Ry 1st mtg. 5s. 80, Cov. & Cin. St. Ry 2d mtg. 5s. † Assumed by the Cincin. St. Ry. Co. 1\$250,000 reserved to retire 1st mtg. bds.	45,000 100,000 8 581,090 250,000 400,000	2,500,000 46,000 100,000 581,000 250,000 400,000	1900 1905 1906	J. & J. A. & O. A. & O. M. & S. M. & S. J. & J.	114 % 108 % 114 108 % 121 % 182 %	115 104  1221/ <sub>9</sub> 187	Union Passenger Ry	29,785,000 250,000 750,000	29,724,876	1945 1905 1906	A. & O.	===	
Date of Quotation- June 4. 1800.  Brooklyn Street RR. Co1st mig. 6s. Sln. New't & Cov. St. RyCons. mig. 5s. Sleveland City Cable Ry1st. mig. 5s. Cleveland Electric RyCo. 1st mig. 5. St. Cov. St. Ry Co. 1st mig. 5s. St. Cov. St	- 8,000,000 - 2,000,000 - 8,500,000 - 1,500,000 - 1,000,000 - 600,000 - 600,000	1,000,000	1922 1909 1918 1918 1910 1922 1915	M. & S. M. & N.	106 % 118 % 105 % 106	107 114 ½ 106 107 107 ½	Date of Quotation – June 4 1900 Birmingham, Knox & Allentown	875,000 1,250,000 1,500,000 50,000 1,250,000 750,000 250,000 1,500,000 1,500,000 1,500,000	875,000 1,250,000 1,500,000 50,000 1,250,000 750,000 250,000 1,500,000 500,000 1,400,000	1980 1927 1980 1918 1942 1928 1924 1927 1929		1111/4	118
Detroit, Mich.  Date of Quotation—June 4 1900.  Detroit Citisens' St. Ry	1,800,000	8,885,000 877,000 1,800,000	1902	A. & O.	105	102%	Providence R. I.  Date of Quotation - June 4, 1500  Newport Street ByCoupon 5s United Trac. & Elec. Co	50,000	500,000	1918	V. & S.	116	118
New Haven Conn. Date of Quotation—June 4 1100 few Haven St. Ry1st mtg. g. 5s. few Haven (Edgewood Div., list.mtg. 5s. Winehester Avenue RR—ist mtg. g. 5s. Winehester Avenue RRDeben. g. 5s.	250,000 100,000		1914 1912	M&B	111 111 109		St. Louis.  Date of Quotation—June 4, 1900.*  Baden & St. Louis RR	1.818.000	250,000 1,813,000 1,800,000 000 000	1912 1907	J&J	101% 101% 109 17	1023 1023 1003 118

PASSE	VGER I	RAILW	AY			
NAME.	Authorized	Issued.	Due	Interest periods.	Bid.	Ankod.
St. Louis.	1	1	1		<del> </del>	1
Date of Quotation - June 4, 1900.	400,000	400,000	100	M. & N.	108	105
Jefferson Avenue Bylst mtg. 5e. Lindell By. Colst mtg. 5e		1,500.000	1911	F. & A. M. & S.	108 105	109
Missouri RB. Co	400,000	800,000 125,000	1910	A. & O. J. & D.	100	102
People's RR. Co	15,000	75.000 800,300	1902	M. & N.		
St. Louis & E. St. L. Electric. 1st mtg. 6s. St. Louis BR. Co	75,000	75,000 2,000,000	1906	J. & J.	100	101 100%
18t. Louis & Sub. ByIst mig. g. 5s.	2,000,000 800,000	1,400,000 800,000		F. & A.	108 80	104 84
† Southern Electric RyCons. mig. 5s:  Taylor Avenue St. Rylst mig. g. 6s.	500,000	500,000 500,000	1918	J. & J.	106 116	108 118
Union Depot RR. Colst cons. mig. 6s. Union Depot RR. CoCons. mig. 6s.	1,091,000 8,500,000	1,091,000 1,787,000			100 121	100 × 122
†Controlled by St. Louis BR. Co. †Controlled by Union Depot BR. Co.						
Controlled by Lindell BR. Co. \$200,000 in escrow to retire 1st & 2d						
mig. 3\$600,000 in escrow. 11\$200,000 in escrow to retire 1st mig.						
bds. San Francisco Cal.						
Date of Quotation-May, 1900.	1,000,000	900,000	1915	J. & J.	1 114	117
California St. Cable BBlst mtg. g. 5s. †Ferries & Cliff House Rylst mtg. 6s. Geary St., Park & Ocean BB.lst. mtg. 5s.	650,000 1,000,000	650,000 671,000	1914 1921	M. & 8. A. & O.	114	117 95
Market St. Cable Ry. Colst mtg. g. 6s. †Metropolitan Ry. Colst mtg.	8,000,000 200,000	8,000,000	1918		126)	
Omnibus Cable Colst mtg. 6s. Park & Cliff House BBlst mtg. 6s.	2,000,000 850,000	2,000,000 850,000	1918 1912	A. & O. J. & J.	126 % 105 %	107
†Park & Ocean BBlst mig. 6s. †Powell St. Rylst mig. 6s.	250,000 700,000	250 000 700,000	1914 1912	J. & J. M. & S.	115	125
Sutter St. Ry. Co	1,000,000	900,000	1918	M. & N.	• • • •	•••••
Washington D. C.  Date of Quotation—June 4, 1900						
Relt Rv. Co	500,000 500,000	450,000 500,000	1920 1914	J. & J. A. & O.	182	••••
Columbia Ry	200,000 500,000		1911 1901	J. & D. J. & J.		•••••
†\$50,000 in escrow to retire let mtg.bds. Miscellaneous.						
Bate of Quotation- June 4, 1900.	0.000	1.000				
Bridgeport Traction Colst mtg. 5s. Buffalo (N. Y.) By. CoCons. mtg. 5s. t( 'tisens' St. B. (Ind'polis).lst cons.m.5s	2,000,000 5,000,000	1,688,000 8,548,000	1981	J. & J. F. & A.	108 118	110
Orosstown St. Ry. (Buffalo)lst. mtg.5s. Columbus (O.) St. Rylst cons. g. 5s.	4,000,000 8,000,000 8,000,000	8,000,000 2,866,000 2,261,000	1932	M. & N. M. & N.	104 112	103 118
Consolidated Traction (N. J.)lst mtg.5s	15,000,000	18,965,000 572,000	1933	J. & J. J. & D. J. & D.	1115 11114 115	 111% 115%
Orosst'n St. Ry. (Colu's, O.)lst mtg.g.5s Denver City Cable Rylst mtg. g. 6s. Denver Con. Tram'y CoCon. m. g. 5s.	4,000,000 4,000,000	8,800,000 922,000	1920 1933	J. & J. A. & O.	20 80	85
Louisville (Ky.) Rylst cons. mtg. g.5s. Minneapolis St. Rylst cons. mtg. g. 5s	6,000,000 5,000,000	4,981,000 4,050,000	1919	J. & J. J. & J.	119 110¼	11914 11014
TNO. Hudson Co. Ry. (N.J.). Cons. mtg. 5s. No. Hudson Co. Ry. (N.J.)2d mtg. 5s. No. Hudson Co. Ry. (N. J.) Deb. 6s.	8,000,000 550,000	2,378,000 550,000	1928	J. & J. M. & N.	108	
Paterson (N. J.) RyOons, mtg. g. 6s. Kochester (N. Y.) Rylst mtg. 5s.	500,000 1,250,000 8,000,000	489,000 1,000,000 2,000,000	1981	F. & A. J. & D.	::::	
St. Paul City Ry	5,500,000 1,000,000	4,298,000 1,000,000	1937	A. & O.	105¾ 108	106
181,000,000 in escrow to retire 1st and	_,,			••••	1	••••
d mig. bds. 15800,000 in treasury. Bonds guar. by					ĺ	
Buffalo Ry. Co. 1\$760,000 in escrow to retire bonds of O. St. RR. Co.						
\$87,000 in treasury. \$960,000 res'ved to redeem prior liens.						
1 †\$620,000 in escrow.			ł		•With i	at'rest
ELEOTRIO LIGHT AND	ELE	CTRIC	AL			os,
Boston, Mass.  Date of Quotation—June 4, 1900					1	
Delaware Gas Lt. Co.,1st m. 5s, g.	800,000 2,025,000	800,000		J. & J. Quar.	106 157	103
	10,000,000	8,750,000	1922		116	
Pittsburg Pa Date of Quotation—June 4, 1900	1					
Allegheny County Light Co	500,000 195,570		1911	J. & J. M. & S.	110	•••••
Miscellaneous.—(June 4, 1900.)	4,812,000	4,812,000	1910		109	
E ison El. Ilig. Co. (N. York) ist m. 5s E ison El. Ilig. Co. (N. Y.) con. m. g. 5s. E ison Elec. Ilig. Co. (Brooklyn)	15,000,000 5,000,000	2,188,000	1993 1940		124 1223	124
E iison Electric Light (Philadelphia) Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,000,000 2,500,000	2,500,00	1937	A. & O.	100	103
Kings Co. El. Lt. & Po. Co.pur. money 6s Milwaukee El. Ry & Lt. Co.lst con. g. 5s.	5,176,000 8,000,000	6,103,0	]	A & O. F. & A.	120 102½	122
United Elec. Light & Power Oo(N. Y.)	AND 7	TELEG	RA	PH.	•••• 1_	••••
Miscellaneous.	1		Ī	1		
Date of Quotation—June 4. 1900, American Bell Telephone4s.		1	908	F. & A.	100½	101
Northwestern Telegraph Co					114	115
Chempeake & Potomac Teleph. Co5s.			911	J. & D.	108	106
ALLIED	INDUS	TRIES	3.			
Miscellaneous.  Date of Quotation—June 4, 1900	İ					
American Electric Heating78. Armington & Sims Engine Co	500,000			••••••	••••	25
Barney & Smith Car Co	********		1942 1904	J. & J. J & D.	106	107
Worthington Pump Co   Nominal	75,000	•••••••	1	l	115	127

# NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 161@161c.; Lake, 161@161c.; cast-

A dividend of \$10 per share has has been declared on Calumet & Hecla Mining stock, payable June 28.

The business men of Worcester, Mass., will incorporate the Citizen's Telephone and Telegraph Company, capital \$330,000.

The Dyslestown & Willow Grove Trolley Company of Doylestown Pa., has

been transferred to a successor company for \$950,000

The Chicago City Railway Company has declared a dividend of 3 per cent., payable June 39. Books close June 15 and reopen June 21.

A dispatch from Altoons, Pa., states that a new electric light, heat and power company, with \$1,000,000 local capital, has been formed.

At a recent special meeting of the board of directors of the Metropolitan West Side Elevated Railway Company of Chicago, Clarence S. Day was elected a director.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 18(2,20; New York Electric Vehicle Transportation, 8(2,84), New England Transportation, 4(4,44); Gramophone, 35(4,46).

The capital stock of the Granville, Washington County, N. Y., Telephone Company has been increased from \$10,000 to \$30,000. The directors include Frank E. Hicks, W. A. Tenny, F. T. Pember, F. W. Hewitt and Frederick W. Allen.

It is reported in Elizabeth, N. J., that an attempt is being made by the North Jersey Traction Company and the stockholders of the Elizabeth City and Elizabeth and Plainfield Trolley Company to consolidate the three systems.

The railroad commissioners of Massachusetts have authorized the Union Street Railway Company of New Bedford to issue capital stock to the amount of \$150,000 in addition to its present capital of \$450,000, and also to issue mortgage bonds to the amount of \$50,000.

The report of the United Traction Company of Albany, N. Y., for the week ending May 24, shows receipts amounting to \$25,620.44 against \$20.983.79 for the same week last year. The gain on the Albany division is \$1,620.65 and on the Trey division \$1 416 69.

Stockholders of the Amalgamated Copper Company met on June 4 and re-elected the board of directors as follows:—Marcus Daly, H. H. Rogers, William Bockefeller, James S.illman, F. P. Olcott, Robert Bacon, A. R. Sauer and A. C. Burrage. No financial report was submitted.

The directors of the General Electric Company at their meeting on June 1 declared the regular quarterly dividend of  $1\frac{1}{2}$  per cent. on the common stock and a regular semi annual dividend of  $3\frac{1}{2}$  per cent. on the preferred stock. The common dividend is payable July 15 and the preferred July 31.

It is reported on good authority that the Electric Company of America has disposed of its two Long Island plants for \$1.000,000. The interests behind the reported purchase, it is said, are identified with the Consolidated Gas Company of New York, and the money is to be paid by the middle of of June.

It is understood that over 9) per cent. of each of the two classes of Welsbach Commercial stocks and 86 per cent. of Welsbach Light stock have been deposited under the plan to consolidate with the new Welsbach Company. Monday the latter notified the Provident Life & Trust Company of its election to purchase the stocks deposited under the plan.

The earnings of the Metropolitan Street Railway Company, New York, for May were \$1 283.428, as compared with \$1,221.115 in the corresponding month last year, a gain of \$59 313. From July 1 to May 31 earnings are set down at \$13,011,439, a gain of \$1.497,037. As yet no announcement has been made of the plan of the proposed new stock issue of the company.

Mr. Grant, receiver for the Forty second Street, Manhattanville and St. Nicholas Avenue Railroad. New York, recently filed with the clerk of the United States Circuit Court his report of the earnings and expenditures of the road for April. The cash receipts for the month were \$51,835 31, which, with a cash balance from March of \$18,815,12, brought the total up to \$70,650.43. The disbursements for the month footed up to \$48,168 85.

In connection with the recent sale of \$2,000,000 five per cent, collateral trust bonds of the Eric Telegraph & Telephone Company it is stated that the purchasers were Wilson & Stephens, who, with Toland Brothers & Co. and Townsend, Whalen & Co. of Philadelphia will shortly make a public offering at 1021 and interest. It is stated that nearly half of the above amount has already been privately sold to Philadelphia, Boston, and New York interests.

The reorganization committee of the General Electric Automobile Company, comprising G. M. Dodge, New York; George Tracy Rogers, J. S. Arndt, J. M. Butler and Thomas E. White, is about to issue a circular calling for an assessment of \$4 a share on the 59,000 shares of capital stock, payable in two installments of \$2 each. The company owes \$50,000, so that it all the shareholders pay up there will be \$150,000 left for working capital.

The extensive properties of the Elmira (N. Y.) Municipal Improvement Company, formerly owned by Col. D. C. Robinson, were recently sold by S. S. Taylor, the receiver, under foreclosure proceedings on the \$1,800,000 mortgage held by the Guaranty Trust Company of New York. The purchase was made by the reorganization committee for the New York Mutual Life Insurance Company. The industries will in the future be conducted by the Elmira Water and Light Company, which was lately incorporated. The sale covers among other things the Elmira Gase and Illuminating Company's plant, the electric light slant, and appropriate and the sale covers among other things the Elmira Gase. and Illuminating Company's plant, the electric light plant and property, and the traction company property.

A big deal in Southern street railway securities has just been closed, and by it A big deal in Southern street railway securities has just been closed, and by it the Mercantile Trust & Doposit Company of Baltimore, Md., secures \$2500,000 of the first consolidated bonds of the Atlanta Railway & Power Company, which is a consolidation of street railway and power properties at Atlanta. Ga., and \$1,000,000 of the first mortgage bonds of the Augusta Railway and Electric Company, which owns the street railway and lighting properties at Augusta, Georgia. Of the Atlanta purchase \$1,000,000 is subscribed to by prominent citizens of Atlanta, \$500,000 by the New York Security & Trust Company and the remaining \$1,000,000 will be retained by the Mercantile Trust and Daposit Company. The purchase of the Augusta bonds was made jointly with the New York Security & Trust Company.

It is announced that the Bergen Turnpike Company has sold its six miles of road from Hackensack, N. J., to the Hudson County line to representatives of the Consolidated Traction Company. It is now said that the Consolidated has been acquiring right of way from its line on the l'aterson Plank Road through Moonarchie and Little Ferry, from where it can reach Hackensack through the turnpike. The turnpike was offered to the Newark and Hackensack Company for \$69,000 and to Bergen County for \$49,000. It is capitalized at \$52,000 and is said to have been sold above par. It paid a \$4 dividend on each \$10 share last November and \$1 a share just before the sale. The corporation was chartered by the State in 1802, and has always been in the hands of Bergen County people. The road was originally eleven miles long to Hoboken, but the Hudson County end was sold to that county two years ago.



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# FLECTRICITY

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#### SUBSCRIPTION RATES:

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# EDITORIAL NOTES.

The Telephone Situation.

The present condition of telephone practice in this country appears to leave little to be desired except lower rates. For simplicity of construction and

durability of apparatus to meet present requirements the layman can scarcely imagine improvements of any particular importance.

There are no systems in the broad electrical field better adapted to meet the requirements of public service than our present telephone equipments.

The employment of some of the best engineering skill, and the use of unlimited capital for commercial exploitation, has brought rich financial returns from many directions, which in turn has enlisted an increased amount of capital to network our larger cities and villages with wires, and to connect them at a most astonishing rapidity.

By comparison with the service in foreign cities our systems are remarkably quick and efficient. They leave little to be desired as far as serviceability is concerned, and this has resulted in a growth limited only by the present tariffs; but the telephone electrician who has closely watched the development of telephone inventions during the last decade knows full well that the Bell monopoly and its allies have bought up and shelved practically all of the most important telephone improvements and have hidden them from the light of day, while many an important invention that contained the germ of radical improvements has been stifled for lack of a competitive independent market.

A lowering of rates by the Bell monopoly would have resulted in an increase of the number of subscribers in almost an arithmetical progression; for the telephone, like the necessities of life, is widely and constantly desired.

Up to the time the independent companies commenced to enter the field, only the larger business houses could afford to pay the high rates. After the formation of independent companies, and the inducements offered by competitive tariffs, we saw a wider and larger use of the telephone, and these independent plants were quickly working to their full capacity, and even at this early date, competition is making itself felt in no small measure, even in the country towns and smaller cities where former rates were practically prohibi-

tive. To-day we are commencing to see the isolated farmer in thinly settled districts enjoying its benefits, while even the smaller towns are now connected by independent trunk lines.

Telephony has been a business in which capital has had the most decided and substantial certainty of beneficial returns, considering the amount of capital invested.

The monopolistic benefits of concentration have been no better exemplified in any line of business than in this, while the public—well it was wholly dependent for reasonable tariffs on the good graces of the telephone management, but in no other line of business have good graces been so sadly lacking, for a policy of the greatest benefit to the greatest number has been wholly ignored by the Bell monopoly from the first.

Strongly intrenched behind iron-clad patents, and free street franchises, and practically in absolute control of the conduit systems in the larger cities, where their money owned the politicians (who prove false to the interests of their constituents), the Bell Company charged exorbitant rentals for inferior instruments, refused to adopt improved apparatus, simply because they were in a position to do so, and thus save the expenses of a change. Following the custom of bandits they said, "Hands up" to the people, and pursued a policy of "The public be damned," pay our extortions.

All high-handed procedure must finally have an end.

The independent telephone opposition is teaching its beneficial lessons.

The policy of a little good to the favored few is being changed into a great good to a large number.

A strictly monopolistic management is seldom decidedly progressive, for such a management finds it easier to use imperfect apparatus, and do a comparatively small business at an exorbitant profit, rather than to adopt improved means and do a large business at a relatively small tariff with a final larger profit.

Telephone trunk line charges are decidedly high even when compared with the telegraph.

We are told they are necessarily so, from other than monopolistic reasons. We are authoritatively taught by the Bell people that we have not yet learned to quadruplex our telephone lines, or use machine methods of transmission, and thus work the wires at a high rate of speed or to employ as poor a class of line construction and secure permanent and

desirable service; and here again is more misleading sophistry—another case where it is easier to charge higher rates for a small quota of business, rather than broaden out and make even more money by doing a larger business at a lower rate.

The telegraph company assumes the expense of a messenger service to collect its telegrams, and likewise it is to a like expense in delivery and in addition it furnishes the stationery, while in the long distance telephone service these expenses practically are lacking. It scarcely more than furnishes an operator to call up and plug in, and this operator looks after several customers at the same time, while its patrons are their own senders and receivers.

If the Bell Company has a high grade of line construction for long distance service, it is for reasons of utility; the same reasons that govern the telegraph companies in constructing heavy copper trunk lines, officials of both systems of communication having learned from experience that high grade construction is really the cheaper.

Our present toll line telephone rates are without valid reason excessively high, and here again independent telephone opposition will reap a reward and do the public a lasting benefit.

Inventors and the

At frequent intervals patents expire, which throws open to the investing pub-Investing Public. lie a certain branch of industry hitherto controlled

by possibly one company or a certain clique of wealthy men. Thus, some six years ago, a number of important Bell telephone patents ran out, which allowed of independent manufacturers entering this field.

Some two weeks ago a number of patents taken out by Mr. Thomas A. Edison on lighting and transmission appliances expired, which, although not fundamental, are of sufficient importance to warrant mentioning.

Three of the patents which have just expired referred to various details in the incandescent lamp. One made a vacuum of the bulb, a second covered the introducing of volatile carbon, or silican compound, which was supposed to decrease the resistance of the carbon in the bulb, while the third referred to details in exhausting the bulb and the providing of the lamps with nitrogen. Other patents which expired referred to details of dynamo construction, such as the well known Edison dynamo regular; movable commutator brushes with hand operated adjustment devices therefor, and that which claimed the connections with dynamo field magnet coils.

Referring to the effect the expiration of these patents would have in a commercial way upon the electrical world, Mr. Edison took occasion to deplore to a representative of the N. Y. "World" the inadequate protection afforded inventors in this country, and among other things said:

"It is all very true that these patents have expired. As to the effect it will have I can make no statement that would be clear or readily understood. All of these patents were in line with the general improvement of the electric light and the perfecting of the dynamo. They were what scientists call subsidiary pat-

"I deny that I have had any monopoly with them or with any patent I ever secured. An inventor has no show these days. The moment he invents something that is an epoch marker in the world of commerce or science, there will be pirates to spring up on all sides to contest his rights to his ideas. These pirates can readily get millions at their back. They go to the courts and enjoin the inventor from using his own creation. By the faulty system of United States courts these pirates are enabled to hold the inventor for ten, twelve or fourteen years from the use of his invention. Meanwhile the court allows them to proceed with the use of the same device, so there is no monopoly. The inventor always gets the worst of it in the courts, even though he may hold in his hand the patent from the United States Government."

After stating that he had expended \$1,000,000 trying to establish his claim to the incandescent lamp and only succeeded when the patent had but three years left to run, he continued:

"I am not saying this in a humor of complaint, for I can make money anyhow. But it is a miserable system we have in this country that cuts the poor man out of his invention. I know of several inventors who were poor. Their ideas would have made them millionaires, but they were kept poor by the pirates who were allowed to usurp their rights in the courts. This usurpation is particularly apt to result in the case of some great epoch-making patent. I could invent a new monkey-wrench which might go without infringement, but the moment I take certain forces and work out a moving picture for the first time in the history of the world like that produced by the kinetoscope, mark you how the pirates rise up and call it their own."

That there is considerable truth in what Mr. Edison states, namely, that inventors are frequently deprived of their just deserts, cannot be denied, but on the other hand, owing to a more or less defective patent system, a patent in this country may, by clever manipulation, be kept alive considerably longer than it should be in justice to the public, as, for instance, in the case of the Berliner patent. The apt saving, "what is one man's meat is another man's poison," would seem to apply in this case, so that we fear it will be some time before laws will be enacted that will please both the inventor and the investing public.

The Use of Wireless Telegraphy.

William Marconi, the wireless telegraphy expert, is again in this country after an absence of several months. The exact object

of his visit at this time has not been made public, but it is rumored that it relates in some way to proposed extensive experiments with a view to the adaptation of wireless telegraphy to commercial use.

That wireless telegraphy is coming more and more in use as a means of communication is generally acknowledged. For some time past experiments have been conducted with this method of signaling in New York harbor, at Newport News, Va., and at several other places. The results obtained have been exceedingly satisfactory, so much so that Brigadier General Greely, has ordered wireless telegraphy stations located in the harbor of San Francisco, in Porto Rico and in the Philippines.

But the United States Government is by no means the only one that has been examining into this comparatively new method of sending dispatches. Those of France, Germany, Italy and England have not been idle. According to Mr. Marconi the French navy now employs his system, while several of the German liners are equipped with wireless telegraphy apparatus, by means of which they not only announce their arrival at their European ports, but many miles from land receive bulletins of all the important news which had become known while they were at sea. The Italian navy also makes use of this system on a limited scale, while the English Admiralty is gradually introducing Mr. Marconi's system on all of its principal vessels. Referring in a recent interview to the use of wireless telegraphy in South Africa, Mr. Marconi is reported as saying: "It is used for communication between the cruisers and the Admiral at Delagoa Bay, and has proved successful for a distance of eighty miles, which is the best that can be done with the power to be had there."

When questioned as to the invention of Gen. Baden-Powell's brother, Signor Marconi said he had experienced some difficulty in procuring means for the elevation of the wire that is attached to the instruments, which should be raised about 100 feet above the instrument for telegraphing sixty miles. The problem had been solved by the invention of a system of kites by Baden-Powell, and this device had been of great service to him in his experiments

There are ten sets of instruments in use in Lord Robert's army, but owing to the great difficulty of communicating with the army, it has been impossible to learn much concerning the results obtained.

From the above it will be seen that the nearest wireless telegraphy has come to being made use of in a commercial way, is on a limited number of transatlantic steamers. For this purpose, and for signaling between war ships or army corps, it would seem well adapted, but there are several good reasons why it will not replace the existing method of commercial telegraphy, at least not for many years to come, if ever.

# UNDER THE SEARCHLIGHT.

# Notes and Comments on Various Topics.

Ir is expected that no less than one thousand telephone men will meet in Cleveland this week to discuss ways and means of improving and extending the independent telephone ser-

THE annual convention of the Electric Storage Battery Company of Philadelphia was held last week at the Walton Hotel in that city. About forty delegates were present. Papers were read and discussions indulged in, while the entertainment feature consisted of planked shad dinners and excursions to various points of interest.

THE Metropolitan Street Railway Company of New York City will shortly operate storage battery cars on its Thirty-fourth street crosstown line. A number of the new cars have already been received, and all that remains to accomplish a complete change in the road is the replacing of the present light rails with heavier ones.

The second hearing before the Railroad Commissioners of Boston, Mass., on the matter of assessing the cost of building and maintaining the proposed electrical power attachment for opening and closing the Slade's Ferry drawbridge, will be held June 21.



THE Siemens & Halske Company has started a small electric lighting station in the European quarter of Pekin, which it is hoped will overcome the prejudice of the Chinese merchants, so that they, too, will become consumers.

In Bremerhaven, Germany, at the mouth of the Weser, has recently been erected a 150-ton electric pivoted derrick, which is the subject of a leading illustrated article in "Le Génie Civil." It is of T-shape, the fixed portion being an open steel structure reaching up to the elbows of the T, while the movable portion consists of a truss forming the arms, with a stem or core reaching to the ground and revolving inside of the fixed support. The derrick is made to rotate by means of an electric motor, of 26 horse-power, running at 550 revolu: tions per minute through the medium of an endless screw and three pairs of gears, by which the speed is so reduced that the derrick requires 7.2 minutes to make one complete turn. An electric carriage travels along one arm of the T, and at the end of the other there is a counter-weight. The derrick is 118 feet high.

ELECTRIC cars are now in operation on the principal streets of St. Johns, Newfoundland. The current which provides the power, as well as that for lighting, is generated nine miles from St. Johns. The physical characteristics of the region lend themselves admirably to the success of this enterprise. There is a chain of four connecting lakes, and from the outlet of the last runs a flume, which is built along a steep hillside for 3,300 feet, until it disappears into a tunnel cut 350 feet through a bluff of solid rock. At the end of the tunnel is a huge sluice box of timber to the bottom of which is fixed a steel tube. Through this the water drops 185 feet on a large water wheel in the power house, which sets the machinery in motion. The capacity of the plant is 1,600 horse power, but the flume is of sufficient capacity to drive another plant of like size. The current is transmitted from the power house to a sub-station in St. Johns at a pressure of 15,000

The formal opening of the American electrical section at the Paris Exposition took place on the afternoon of June 6, when Francis E. Drake, the director, handed the section over to Commissioner General Peck. A number of short speeches were made, and afterward a small party of invited guests examined the exhibits in the Salon of Honor.

A DISPATCH from Berlin states that the Council of that city has resolved that hereafter it will build, operate, and maintain all street car lines for the municipal account. The Grosslichterfelde has been built, and trial electric trains, making eighty to ninety kilometers hourly, are being run. Soon such trains will be introduced on several lines.

Two Japanese railway officials, Y. Sasaki, general manager of the Nankai Railroad, and K. Nishino, traffic manager of the Sanvo Line who have been making a tour of the world, recently inspected the Brooklyn Rapid Transit Company's system. They expressed themselves as pleased with the operation of the railroad, and as particularly impressed with electricity as a motive power. Mr. Sasaki, referring to his own country, said: "Most of our railways in Japan, were built by English Engineers. There is little electricity there.

Nearly all of the power is that of horse or steam. The Americans, we have noticed, are leaders in electric railways. Even in England and Scotland we saw that the electrical machinery was made by Americans and the maker's name on the machinery. Nothing can compare with electricity for city railroads."

THE Committee of Parliament, to whom the question of constructing a high speed electric railway between Manchester and Liverpool, in England, was referred, as outlined in our last issue, has reported against the project. It admits that "the mono-rail system when fully matured is likely to make an important contribution to the development of railway traffic at high speed." The principle involved is conceded to be good. But the committee was "not satisfied that a safe method of applying brakes to trains going at very high speed had been devised." Besides this, there was a "disregard

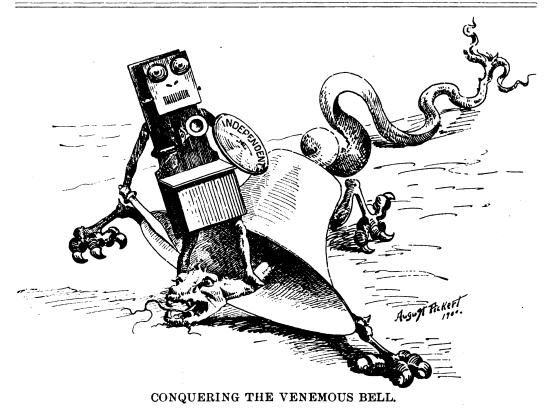
# Telephone Men in Council.

Great Gathering of Independents at Cleveland.

Judge James M. Thomas to Preside-Many Interesting Papers to be Read-Important Exhibits of Telephone Apparatus.

Thanks to the indefatigable work of Judge James M. Thomas, C. W. Wason and others everything is in readiness for the Fourth Annual Meeting of the Independent Telephone Association of the United States to be held in Cleveland from June 12 to 14.

The headquarters of the Association is in



of existing interests" in the route selected for the proposed railway. It would not serve the district between Manchester and Liverpool, though it would call upon it to make sacrifices. At Salford and at Liverpool the exercise of the right of eminent domain would interfere with important existing interests. Another drawback was that the company did not propose to enter the cities of Liverpool and Manchester underground, and nowadays an underground approach is the only one that deserves to be considered when a new railway is proposed.

The Suez Canal Company, according to the "Electrician," London, has decided that every vessel, before it can pass through the Suez Canal, must satisfy the company's agents at Port Said or at Suez that it has on board (1) at least one electric searchlight of sufficient power to illuminate the channel 4,000 ft. ahead and constructed so as to admit of rapid splitting up of the beam of rays into two separate segments, with a dark sector in the middle; and (2) with electric lights capable of lighting up a circular area 700 ft. in diameter.

the Electric Building, where a room has been especially prepared for the holding of the meetings. Besides a number of interesting papers to be read on topics of interest to telephone men, arrangements have been made in the way of excursions and outings, that should prove most delightful, especially to the visiting ladies. An opportunity will also be afforded the delegates and their friends of examing the most modern telephone apparatus and appliances which will be exhibited by the various independent telephone manufacturers. The programme is as follows:

Monday, June 11.

The Ohio Telephone Association will meet at twelve M., in the Electric Building, for the purpose of organization to assist in the entertainment of the delegates and visitors,

At 8 P. M. there will be a meeting of the Advisory Board and Executive Committee of the Independent Telephone Association of the United States of America, at the headquarters of the Association on the third floor of the Electric Building.

TUESDAY, JUNE 12.

At 8 A. M. the headquarters of the Associa-



tion will be opened for the purpose of registering and issuing credentials to the delegates and visitors. The headquarters will be in room 301, third floor of the Electric Building. All persons are required to register before receiving credentials and tickets to the various entertainments.

At 12 m. first session of the Convention will be called to order in a room prepared especially for this occasion on the first floor of the Electric Building.

First will be an address of welcome. Second response, which will be followed by preliminary business and general introductions. After lunch the balance of the day will be devoted to inspection of the various exhibits of the manufacturers and material men, which will be on the first, second and third floors of the Electric Building.

In the evening a reception will be given by the Cuyahoga and United States Telephone Companies, on the seventh floor of the Electric Building, at which time the offices of the different telephone interests will be thrown open to visitors and the switchboard of the Cuyahoga Telephone Company inspected. There will also be music, flowers and light refreshments.

#### WEDNESDAY, JUNE 13.

At 10 A. M. the second session of the Convention will be held. The President will deliver his annual address, after which the following papers will be read:

"Toll Line Traffic," J. B. Ware, secretary and general manager of the Citizens: Telephone Company, Grand Rapids, Mich. Discussion.

"Telephone Development," Ed. L. Barber, president of the Northwestern Telephone Construction Company, Wauseon, O. Discus-

"Telephone Investments," Hon. Hugh Daugherty, president of the United Telephone and Telegraph Company, Bluffton, Ind. Discussion.

"Our Duty to One Another," Hon. C. W. Kline, president of the Interstate Telephone and Telegraph Company, Philadelphia. Discussion.

"Telephone Construction," Jas. E. Stewart, consulting engineer to the Telephone, Telegraph and Cable Company, New York.

In the afternoon the ladies attending the Convention will be given a tally-ho ride through the parks and boulevards, leaving the Colonial Hotel at 2:30.

In the evening the ladies, the delegates and their friends will be entertained at Hallworth's Garden. A special car, tendered by the Clevelar.d Electric Railway Company, will leave Euclid avenue and Bond street at 7.15 o'clcck. THURSDAY, JUNE 14.

At 10 A. M., the third session of the Convention will be called to order at which the following matters will be taken up: First, unfinished business; second, election of officers; third, "The Glad Hand to New Members," followed by inspection of exhibits and social sessions.

In the afternoon a boat ride has been planned for the delegates and their friends. The steamer "City of Erie" of the Cleveland and Buffalo Transit Company will leave the foot of St. Clair street at 2 o'clock, returning at 6.

In the evening at 8 o'clock the banquet will be held. This will be the great social feature. The best the land and sea affords to eat will be placed before the visitors. There will also be music andflowers and much eloquence as may

be inferred from the following programme of toasts:

Hon. Harry D. Critchfield, General Counsel of the United States Telephone Company, toastmaster.

Music. The Manufacturer.....

LADIES ON THE RECEPTION COMMITTEE. Mrs. H. W. Avery, Mrs. D. J. Kurtz, Mrs. J. A. Ebersole, Mrs. S. R. Driffield, Mrs. W. A. Foss, Mrs. H. J. Davies. Mrs. H. W. Jones. Mrs. H. C. North, Mrs. L. Sands.

Mrs. A. B. Foster,

### JAMES MILTON THOMAS.

Judge James M. Thomas, President of the Independent Telephone Association of the United States, was born in Ross County, Ohio, on April 24, 1858. He is a descendant of Samuel Thomas, who emigrated to America in 1620 as one of the Mayflower's sturdy passengers, and settled in New England.

Like many other prominent men, his early years were spent on a farm where he found



JAMES MILTON THOMAS, President of the Independent Telephone Association of the United States.

The reception Committee which will look after the enjoyment of the delegates and their friends is as follows:

D. J. Kurtz..... The Wm. Bingham Co. A. M. Barnes..... Miller Chemical Engine Co. J. A. Ebersole.....The Geo. Worthington Co. Wm. Smith....The W. M. Pattison Supply Co. H. J. Davies......National Carbon Co. H. W. Jones.....Cleveland Supply & Mfg. Co. A. B. Föster.....Cleveland Electrical Mfg. Co. G. C. Steele.....North Electric Co. H. W. Avery..... Avery Stamping & Tool Co. L. Sands......Williams-Abbott Elec. Co. W. P. Bowan.....J. A. Roebling's Sons Co-H. T. Pratt..... American Steel & Wire Co. C. S. Powell.... Westinghouse Elec. Mfg. Co. S. R. Driffield......Consumers Rubber Co-W. A. Foss.... American Toll & Telephone Co. Carl Seyler......McIntosh Huntington Co. C. W. Wason.....Cuyahoga Tel. Co.

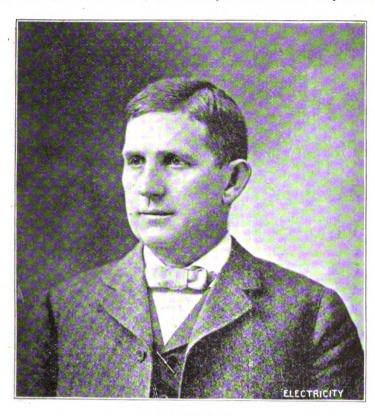
time to attend the district school and qualify himself for teaching. After attending the Ohio Wesleyan University at Delaware, Mr. Thomas took up the study of law and was admitted to the bar in June, 1884, and immediately entered upon the practice in Chillicothe. Having a good knowledge of the principles of law, a general acquaintance in the community and the full confidence of the public, as well as his colleagues at the bar, he soon built up a profitable practice, which continued to increase until 1893, when he was elected Judge of Probate.

To the public at large, and especially to the readers of Electricity, Judge Thomas is probably best known as a prominent, if not the most prominent independent telephone leader. He was the original choice for the office of President of the Independent Telephone Association of the United States, and the healthy

condition in which that body now finds itself attests his ability and talent as a business organizer.

#### GEORGE W. BEERS.

George W. Beers, one of the leading spirits in the independent telephone movement, hails board in room 215, Electric Building, Cleveland, during the coming telephone convention, where they will be pleased to see all of their friends, and to explain the merits of their goods. It is expected that they will be represented by Messrs. J. H. Montague, and J. F. Hemenway. They also state that they are making the ex-



GEORGE W. BEERS.

from the State from which all prominent men hibit in connection with that of the McIntoshapparently spring - Ohio. He is now, however, a resident of Fort Wayne, Ind., where he moved some eight years ago.

Mr. Beers has many business interests and is connected with many prominent commercial and financial industries. Among others, he is a director of the Citizens' Trust Company of Fort Wayne, the largest trust company in Northern Indiana. It is in connection with the Telephone, Telegraph and Cable Company of America that Mr. Beers is best known, the independent company that was organized in 1899 by a number of Eastern capitalists with the help of Mr. Beers to compete with the Bell monopoly and furnish telephone service at reasonable rates. In this movement, Mr. Beers has been most prominent and the results already achieved and shortly to be brought about are in great part due to his untiring efforts and executive ability.

#### THE FARR TELEPHONE AND CONSTRUCTION SUPPLY CO.

The Farr Telephone & Construction Supply Company of Chicago, will occupy room 306, Electric Building, Cleveland, June 12, 13 and 14, during the convention of the Independent Telephone Association of the United States. This company will have a fine display, consisting of several different kinds of telephones, generators, magneto bells, switchboard drops, etc. President C. W. Farr and General Manager E. W. Hurst will be present and glad to meet everyone interested in telephones.

# THE ERICSSON TELEPHONE COMPANY.

The Ericsson Telephone Company, 296 Broadway, New York City, will have an exhibit of their telephones and sample imported switch-

Huntington Co., their Cleveland distributing agents, who are assisting them by arranging



#### BY FRANK C. PERKINS.

Whatever may be said of the status of electric railways, central stations and power plants in England, it must be acknowledged that the "country house" in England has received its full share of attention in both electrical decorations and useful electrical appliances introduced into the household. While it will be noted from the accompanying illustrations that little has been done in these instances in the way of border light effects, ceiling lights and glass panels illuminated from the back, still the electrical lighting has been carried out with great taste and artistic effect. It will be particularly noted that fixtures and hanging lights are largely used, at the same time combination fixtures are not introduced and no gas or other method of lighting has seemed to be considered necessary in case of failure of the electrical plant, which argues well for the reliability of the private electric plant as installed in that country. Messrs. E. Scott & Mountain, Limited, of Newcastle-on-Tyne, Eng. has made a particular study of the needs of English country houses in the way of electric lighting plants and has installed a large number in the finest homes. They say in reference to its reception that there are hardly two opinions as to the superiority of electricity, as an illuminant, over any of the other methods of lighting at present in vogue; but even when no doubt exists on this point, there are often misgivings as to the reliability of the light, its safety, and the advisability of introducing it into houses where considerable expense has already been incurred in decorations. There is no question but that electric light can be installed not only without interfering with



FIG. 1.—DYNAMO HOUSE AND CELLS AT GREY TOWERS.

for outside connections, which will enable their visitors to call outsiders to their telephones. You are invited to call on them.

# The Canadian Electrical Association.

Owing to the fire, the convention of the Canadian Electrical Association, which was to have been held at Ottawa this month, has been postponed to next September.

the wall papers or ceilings, but also that its adoption often makes it possible to choose fittings more in harmony with the general design of the room than would be the case if gas or oil were used.

In addition to these advantages there are of course the better-known benefits arising from the use of the electric light, such as pure air in living rooms, less risk of fire, longer life of all



drapery, hangings and books, and general convenience and utility.

It is interesting to note the neatness and simplicity of the dynamo house and storage bat tery equipment of installation at Grey Towers, seen in illustration, Fig. 1. The generating plant is situated in a separate building adjoining the house, and comprises a locomotive boiler of large capacity which supplies steam to one of Scott & Mountain's vertical engines. This engine drives a "Tyne" dynamo, the current being sufficient to supply all the lights at the same time. Grey Towers is owned by A. J. Dorman and he has a most complete electric lighting and power installation including equipment for 250 lights and several motors for various household purposes. An attendant is not required after the usual hours as the storage battery has a capacity for running the entire 250 lights for three and one-half hours. Electric ovens, kettles, hot plates, small radiators, shaving cups, curling iron heaters, and laundry and billiard table irons are used quite extensively. It may be of interest to note the interior arrangements of some of these English country homes and the accompanying illustra-

### GOVERNMENT TELEPHONE SCHEME FOR LONDON.\*

As the Post Office is about to commence laying the underground mains in connection with the Government scheme for the telephoning of London, it may be of interest to give at this stage a few particulars of the area to be served and the exchanges to be established, together with some preliminary notes on the subject of the cables to be employed, the conduits and manholes to be constructed, and the switchboards and the method of working to be adopted.

The area to be served is that known as the "London Telephone Area," which, to all intents and purposes, is that at present served by the National Telephone Company. It extends from Reigate northwards to Waltham Abbey, and from Romford westward to Harrow, and embraces about 600 square miles.

The Central Exchange will be located in a portion of the premises in Queen Victoria street, presently used by the Post Office for Savings Bank business, and the completion of this exchange is promised within a year.



Fig. 2.—Dining Room at Hutton Hall.

tion will give the reader a fair idea of the interior decorations and lighting effects.

Hutton Hall is about ten miles from Middlesboro and is the residence of Sir J. W. Pease, M. P., and is so well hidden by the beautiful trees that surround it, that the traveler, unless he were especially on the lookout for it, would probably pass it unnoticed.

The electrical plant consists of an "Undertype" engine, dynamo, switchboard and accumulators. The voltage of this plant is 200 volts on account of the distance of the engine room from the Hall. In addition to lighting Hutton Hall, and the stable, farm, etc., the same plant supplies Mr. A. E. Pease's house at Pinchinthorpe, about 14 miles distant. The cables are lead covered and armored and are laid in a trench underground. At Pinchinthorpe the installation consists of 106 cells of storage battery, together with switchboard and necessary instruments. Over 100 lights are used in the house and stables and these are supplied from the storage cells. An illustration of the dining room at Hutton Hall is seen in Fig. 2.

Almost simultaneously with the opening of the Central Exchange, sub-exchanges will be opened at Westminster, Kensington, Wimbledon, Putney, Richmond, Chiswick, Kingston, and Twickenham.

As the work progresses in other districts, sub-exchanges will be opened at about similar distances apart, the nearest to the city in the various directions being probably about Marylebone in the northwest, Islington in the north, Stratford in the northeast, Stepney eastwards, Deptford southeast and in the vicinity of the Elephant and Castle, southwards. With a scheme of sub-exchanges carried out on the lines indicated an excellent service at a moderate rental should result.

The cables to be employed are paper-insulated and lead-sheathed. The advantages which dry-core cables (as cables with paper insulation are called) possess over the ordinary guttapercha and india-rubber insulated cables are low capacity, high insulation, small electrification and great compactness. For subscribers' lines the conductor will weigh 20 lbs, per mile,

the mean diameter being 35.5 mils, and the maximum resistance 43.89 ohms per mile; whilst the conductor of the cables for junction lines will weigh 40 lbs. per mile, with a mean diameter of 50 mils and a maximum resistance of 21.94 ohms per mile. For subscribers' circuits on main lines the largest cable to be used will contain 217 pairs, and the largest size for junction lines will consist of 108 pairs.

The following table gives some useful data

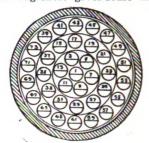


FIG. 1.

as to the various sizes of the two classes of cables to be employed on this telephone work:

TABLE I.

	20-lb. Co	nductor.	40-lb. Conductor.				
Num- ber of pairs.	Mean thick- ness of lead.	Maxi- mum exter- nal di- ameter.	Average weight per mile.	Mean thick- ness of lead.	Maxi- mum exter- nal di- ameter.	Aver- age weight per mile.	
	Inches.	Inches.	Tons.	Inches	Inches.	Tons.	
7	.110	.700	2.48	.115	.880	3,57	
12	.115	.900	3.62	.130	1.150	5.36	
19	.130	1.060	4.78	.140	1.350	7.00	
27	.130	1.250	5.90	.140	1.600	8.63	
37	.140	1.350	6.98	.140	1.750	9.82	
48	.140	1.550	8,24	.150	2.050	12,47	
61	.140	1.650	9.03	.150	2.200	13.85	
75	.150	1.850	10.92	.160	2.450	16.60	
91	.150	1,900	11.54	.160	2,600	18.16	
108	.150	2.100	13.00	.175	2,850	21,50	
217	.160	2,650	19.19				

The paper used for covering the 20 lb. conductor averages 1 inch in width and for the 40 lb. wire \( \frac{1}{4} \) inch, the thickness of paper in both cases being about five mils. The paper is usually laid on longitudinally with a slight overlap, to prevent contact between neighboring wires, and is tied spirally with thin string. The wires are laid up in pairs uniformly twisted together, the length of the complete twist being 4 inches for the smaller conductor cable and 6 inches for the larger. One wire of a pair is covered with white paper and the other wire with colored paper, usually red, as a means of distinguishing the wires for jointing purposes. Between each layer there is a spiral wrapping of paper (usually 5 mils. thick) and a final wrapping of similar paper is added between the outside layer and the lead sheath.

The following table shows how pairs are stranded together to form any size of cable, and Figs. 1 and 2 represent a section of a 37 and a 48 pair cable respectively:

TABLE II.

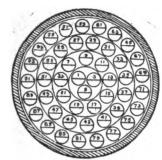
Number	Number of Pairs of Wire.										
of pairs in cable.	Center.	First layer.	Second layer.	Third layer.	Fourth layer.	Fifth layer.					
7	1	6									
12	3	9									
19	1	6	12								
27	3	9	15								
37	1	6	12	18							
48	3	9	15	21							
61	1	6	12	18	24						
75	3	9	15	21	27						
91	1	6	12	18	24	30					
108	3	9	15	21	27	33					

When the stranding has been completed the



<sup>•</sup> From the "Electrical Review," London.

"core" is thoroughly dried at a temperature not exceeding 225° F. In some cable factories this is done by placing the iron drum, on which the completed core has been wound, in a hotair chamber which is kept at a uniform temperature of about 225° F. The time taken to dry the paper by this process varies from three to six days, according to the size of the cable and the amount of moisture in the substance



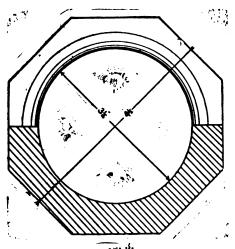
F1G. 2.

of the paper. In other factories the core is placed in an iron cylinder and dried under vacuum, and by this method the drying can be done in about one third the time required by the ordinary oven process.

After the core has been dried it is lead sheathed, molten lead at a temperature of not less than 600° F. being forced on round the core under a hydraulic pressure of from two to three tons to the square inch.

The completed cable is put in a tank of water, where it remains for 24 consecutive hours, in order to prove the sheath, and the cable is thereafter subjected to electrical tests for electrostatic capacity, insulation and conductor resistance.

In the case of both the 20 lb. and the 40 lb. conductor cables, the mean electrostatic capacity of each wire, measured against all the remaining wires of the cable and the lead sheath to each is .08 microfarad per mile; and the mean wire to wire capacity of each pair, all the remaining wires in the cable, and the testing battery and apparatus being involved, must not exceed 70 per cent. of the mean wire to earth capacity. This low capacity is mainly due to the large amount of air space in drycore cables, averaging about 60 per cent. of the entire internal space. Indeed, provided the



paper used has a low specific inductive capacity and has been thoroughly dried, the capacity may be very accurately gauged by the amount of air space in the cable, and this, of course, is regulated by the width and thickness of the paper.

The insulation resistance of each wire in any cable from every other wire in the cable and from the lead sheathing, all of which are to

earth, must not be less than 10,000 megohms per mile after one minute's electrification at a temperature of not less than 50° F., the electrification during the test to be steady. The voltage for this test may be 600, but that usually employed is 450.

#### CONDUITS.

Hitherto the Post Office has confined itself in underground conduits to the use of castiron pipes, but till now the Post Office has never had to lay more than about half a dozen conduits in any one trench. However, this big scheme of telephoning London by means of underground wires brings about an entirely new condition of things. Under this plan 50 conduits in one trench will be quite common in the city, and in special cases this number will be much exceeded. In such quantities 3 inch cast-iron pipes require a large amount of space, and space, even underground, is very limited in London. The Post Office has, therefore, resorted to glazed earthenware ducts in place of cast-iron pipes where the number of conduits exceeds six. An end elevation, showing half section of the form of duct to be employed, is shown in Fig. 3, which also gives the sectional dimensions of the duct. It is made in two lengths, namely, 18 and 24 inches, the shorter duct being used only where the conduits enter manholes for the purpose of breaking joint.

(To be continued.)

# THE MANAGEMENT AND CARE OF A MODERN TELEPHONE CENTRAL OFFICE.

BY P. KERR HIGGINS, A. M. I., E. E.

It is admitted by the majority of telephone engineers, that the future ideal telephone system is one in which the common battery is used, in other words, one in which the power for signaling and talking is furnished from a battery located in the central office. It is true this system is not yet perfected and much improvement will be noticed as the number of such plants increase, but the principle involved is correct. It is more easily and economically maintained and the fluctuation of the power can be kept down to a minimum.

The highest and lowest talking efficiency attained in the local battery system is not quite reached in the common battery system, but the average for all subscribers is very much greater in the latter. Inasmuch, then, as the common battery system is evidently the one of the future (and as enough has been written on the other), we will assume that the central office is so equipped.

No one will dispute the fact that a great measure of the success of a telephone piant lies in the management and handling of the central office; close attention and constant study on the part of those in charge is absolutely essential in order to maintain a uniform, quick and effective service.

We assume that the office has been equipped in a substantial manner, so that with proper care and attention a good and efficient service can be given. This involves the necessity of a plant which requires from the operators the least amount of labor and study, and so arranged as to reduce the possibility of mistakes by them to a minimum.

The plant under consideration is a medium sized one—say 2,000 subscribers—equipped with a switchboard, complete battery outfit, power, main and intermediate cross connecting boards, etc., the switchboard being divided off into sec-

tions of three positions each, each position having about 110 lines to be cared for by an operator. The care of the switch-room proper is placed in the hands of a chief operator, with an assistant if necessary. A special desk is provided for this chief so furnished and arranged as to enable her to monitor all the positions under her care and to keep all the necessary records and information which she may be called on to give to subscribers. By careful study and a series of peg counts, the lines should be so arranged as to balance up, as nearly as possible, the work of the operators, giving to the exchange inspector a note of the numbers to be changed to other positions, so that he may make the necessary cross-connections on the intermediate board provided for this purpose.

THE OPERATION OF THE SWITCHBOARD.

It is difficult to lay down a set of rules by which operators may be governed, but the following may be taken as a base, others being added to meet special cases:

First—All operators must report promptly to the chief at the hours designated and quietly take their places at the positions assigned them

Second—No unnecessary noise or talking will be permitted.

Third—All calls must be answered promptly and supervisory (clearing out) signals watched closely, taking down the connections when the proper signal has been given. Operators must assist each other whenever possible and necessary.

Fourth — Apparatus must be handled with care and in the prescribed manner. All connecting cords must be taken down by the plugs only.

Fifth—Talk closely into your transmitter in a clear and natural tone.

Sixth—Answer calls by "number" and repeat the number given by the subscriber. In making connections be very careful to get the proper line jack and see that it is not busy before completing connection. Never break in on a connection, for by carefully watching your supervisory lamps or signals you will know exactly how the connection stands.

Seventh—Study your work and your subscribers in order that complaints may be avoided. Good manners and patience are absolutely necessary to your success as an operator.

Eighth—Do not turn round when anyone enters the room, but pay strict attention to your business.

Ninth—When in doubt as how to act, or when a subscriber complains or speaks in an improper manner, turn the call over to the chief operator.

Tenth—When you report for duty and when you are relieved, enter and leave operating room in a quiet and orderly manner, always hanging up your receiver in its proper place. Always lock your locker and keep your personal effects in same, not leaving them scattered about.

Women have proven to be the most suitable operators, their voice being more flexible and even, their handling of the apparatus more delicate and swifter, their persistence and patience greater, and as a whole their services are much more acceptable to subscribers. Apart from this, the cost of labor is less.

In choosing operators too much care cannot be taken, and only those possessing the necessary qualifications should be chosen. A good education, good manners, good eyesight and hearing, and a voice clear, strong, and of good



timbre, are absolutely essential. The appli cant should also have good health. It is well in handling operators to relieve them from duty frequently, as this breaks the tension, is humane, and will prove a blessing in disguise. Operators' hours should never exceed eight hours' actual work. They are quick to appreciate justice and when well, firmly, yet kindly handled will require very little disciplining, more especially if good selections have been made in the beginning. Never discipline an operator at the switchboard, take her to one side, otherwise it has a demoralizing influence. and humiliates her sometimes when she is not to blame.

In the sitting room provided for operators there should be placed a 'phone, where they can, when off duty or specially called, talk to their friends. The abuse of this privilege should be treated as a breach of trust. Good literature should also be provided. Tea or coffee in winter and iced lemonade in summer should be provided in the lunch room. These small attentions will be appreciated by the operators, keep them out of mischief and make them better satisfied. A special signal, from chief's desk to sitting room, should be connected for calling operators on duty.

#### CHIEF OPERATOR.

The person holding this position should have exceptional ability, large experience, and be thoroughly familiar with the operation of the apparatus. It will be her duty to assign operators to positions, make a record of same for future reference, and keep in close touch with the operators by means of her monitor, take care of all special calls turned over to her, assisting and helping the operators in every possible way, with a view to greater efficiency. A book should be kept for recording all switch-board trouble, with headings as follows:

Date.	Nature of trouble.	Hour reported.	Date and hour fixed.	Inspector.

This should be neatly and faithfully kept.

Notices should not be allowed on the switchboard, each operator being provided with a small tablet, posted and corrected by the chief as often as necessary. These notices should be as few and as brief as possible and not contain information such as changes, new subscribers, etc., this being the duty of the chief or special clerk.

It will further be the duty of the chief to see that the operating room is clean and well ventilated. Places should be provided for operators' portable head 'phones, and the chief should see that they are put in their proper places and that operators are orderly.

# CENTRAL OFFICE EQUIPMENT.

The plant, during the day and night, will be under the constant care and attention of an inspector, experienced and qualified in every way to care for the same. Inexperienced help (no matter how small the salary) is always expensive and very unsatisfactory, the plant deteriorating very quickly if not cared for constantly by an experienced man.

# DAY INSPECTOR.

He will care for all special trouble, and that which will not interfere unduly with the operation of the switchboard. He will also examine the equipment every day so that when inspected by the chief inspector, at irregular

intervals, everything will be found permanent and in good repair. No temporary work of any character should be tolerated. Especially does this apply to common battery systems. He will make all cross connections, keep cable records, and care for power plant, etc. All charging of batteries should be done, when possible, during the day, and records kept showing discharge readings every hour, also voltage before beginning charge and after end of charge.

#### MACHINES.

These, when not in use, should be tested daily, and when in use the commutators should be kept smooth and properly lubricated. Gale's stick commutator compound has been found very good for this purpose. Brushes must be kept clean and properly set, no sparking being allowed. In smoothing the commutator use very fine sand paper. Neither oil nor dust should be allowed to accumulate on or near the machines, and great care must be taken in starting them to see that the proper resistance is cut in.

#### ACCUMULATORS.

In the care of accumulators (which should be located in a cool room, well shaded) the principal things to be carefully avoided are buckling (twisting or warping of the plates) and sulphating (white patches); also, keep them free from any wire clippings or other material likely to cause short circuits. Uniform and regular charging are absolutely essential to the longevity of the battery and it should be examined every day with an electric lamp so that the bottom of cell may be seen. Hydrometer and voltmeter tests must be taken frequently, and specific gravity not be allowed to go below 1,180, nor above 1,200. Voltage never below 1.9. While 1.9 is given as a safe discharge rate, it is not safe to do this continually. When cells are installed, a certain economical discharge rate is given them as also a certain number of ampere hours capacity, but, as this paper is intended only to cover the general care and is not descriptive of the apparatus, it will be sufficient to say that this economical discharge rate should not be exceeded except on rare occasions, such as breakdowns, etc., otherwise sulphating and buckling of the plates is sure to set in, and, if not remedied, finally ends in the disintegration of the plates. The usual make of plates allows a normal discharge rate of about .0165 ampere per square inch of surface of positive element, and a discharge capacity of 4.5 ampere hours per pound of all elements (positive and negative). When a cell reaches 1.9 or thereby the voltage falls very rapidly, and must therefore be carefully watched when it is necessary to discharge beyond this point. The efficiency of a cell or battery may be increased by charging and discharging to the same point at very slow rates, the efficiency being the quotient of the current taken out divided by that put in. The loss due to internal resistance is proportional to the square of the current flowing. The floor of the battery room and surroundings of the cells should be painted with asphaltum paint to prevent damage by spray.

Evaporation may be reduced by placing over each cell, properly insulated, a sheet of glass; this also helps to keep out dust, etc.

Where fuses are designated they must always be placed and of proper capacity, no wire jumpers being allowed.

Blisters on the plates should be carefully watched and gently pressed back into place by a flat piece of hard rubber or wood—never use

metal. Acid will seldom require to be added unless some has been spilled, and when water is added it should be done with a siphon pump so that it reaches the bottom of the cell. The elements should always be well covered with electrolyte, whether in use or not, only the lugs or connecting rods being exposed. Cells must never be tampered with unnecessarily, and charging should be stopped whenever the cells commence to boil or spray, as any charging done after this (as a rule) is only waste of energy and a waste of the electrolyte, necessitating the addition of more water. When it is necessary to add water, it is found in the end to be more economical to use distilled water, as vegetable and sand deposits are thus avoided and cell easily kept clean. When a cell is in good condition, the positive plate is of a chocolate brown or deep red color and the negative steel gray. No particles must be allowed to fall or remain between the plates.

#### NIGHT INSPECTOR.

He should make regular and systematic tests of all connecting cords, lamps, visual signals, drops, etc., as also a special test of the multiple for false tests, broken test wires, etc. These tests should be continous, that is, as soon as completed, they should be repeated. All broken and defective cords ought to be repaired by him while they are in the switchboard, and only taken out when they are too short or beyond repair. In making repairs, especially in the multiple portion, great care must be taken not to break adjacent wires, connections, etc., and all work done should te permanent.

Where party lines are in use, a test ought to be made each morning with a voltmeter (or biased bell) to determine if the polarity is right. When repairs have been completed, a full report must be entered and initiated in the exchange trouble record.

What are known as "scratchy cords" are frequently caused by brass rubbings collecting on the rubber bushings, therefore, before cutting the cords, it is best to clean the plug thoroughly; sometimes it will be necessary to use fine sand paper for this.

## SPECIAL SIGNS.

Special signs or marks are used in central offices to indicate to operators special conditions, such as: 1. Broken or bad cord, a small piece of fiber tube is slipped over the plug (this is better than tying a knot on the cord). 2. Lines known to be in trouble, especially on common battery systems (where it is necessary to plug them up), are indicated by a rubber plug; if this is not done, operators are liable to tell calling subscribers (wishing this number) that line is busy when it is really out of repair, and in any case, it is found much more satisfactory to tell a patron that the line he wishes is out of order, than to hold him for several minutes, and then tell him you cannot get them. The wire chief notifies the chief operator the moment a line is cleared and she removes the obstruction. The day inspector, also, makes frequent checks of all lines so plugged up, as does the chief operator, and in this way no complaint has been found. 3. Dead lines, that is lines not in use, are indicated by a wooden plug, or better still, short brass paper fasteners. 4. Changes of all kinds are indicated by a small white spot, painted over the jack; this indicates to the operator that all calls for this number are to be turned over to the chief operator or to the information desk, if one is provided.

The operating department proper of an ex-



change should be directly under the manager, and the technical part under the electricians, each consulting and combining with the other, to the end that the highest efficiency may be reached and maintained.

#### MICHIGAN TELEPHONE SITUATION.

[The conditions surrounding the telephone situation in Michigan are in many respects more peculiar than in other States, and the following statement by Mr. J. B. Ware, the President of the Independent Telephone Association of Michigan, will be of general interest at this time.— ED.]

The Michigan Telephone Company has been doing business in the State about twenty years and is a Bell Company, as is officially stated by the president of the Erie Telephone Company (the owner of the Michigan Company), in his annual report January 2, 1899, in which is the following: "The Michigan Telephone Company operates exclusively under the American Bell Telephone Company's perpetual licenses in the State of Michigan."

The independent companies began to operate in 1895. Their growth was at first slow, but during the past two or three years, both Bell and independent have had remarkable growth, exceeding the most extravagant expectations.

In the case of the Bell Company, this growth is easily ascertained from official figures as fol

December	31st, 1896	15,025 to	elephones
**	31st, 1897	16,270	-6.6
66	31st, 1898	19,539	"
66	31st, 1899	32,231	"

Official figures of the Independents on December 31, 1899, are not at hand, but a careful estimate of the State (calling the Upper Peninsula 2,800 - the conditions being comparatively unfamiliar to the writer) showed the number to be about 29,000.

This remarkable growth of the Michigan Bell is easily accounted for as follows:

As competition occurred, the Bell Company reduced its rates below the rates made by the Citizens' or Independent Companies, and in many cases the charges made did not pay operating expenses. Thus, in Grand Rapids the Bell gave two years of free residence service, then made a \$12 residence rate. During the entire period it has had from three to twenty solicitors; it furnishes free service in a number of cities and towns at the present time, by allowing the telephones to remain in service after parties refuse or neglect to pay for same, and even after the telephones are ordered out.

The Bell exchange in Grand Rapids, as in other places in Michigan, has not had sufficient telephone rentals to pay operating expenses during any quarter for over three and one-half years.

The result of competition upon the Bell rates is shown by the following:

BELL EXCHANGE RATES.

	Janua	ry, 1896.	Japuary, 1900.		
	Business.	Residence.	Business.	Residence.	
Detroit	72	48	36	24	
Grand Rapids	3)				
Lansing	<b>- 48</b>	36	24	12	
Kalamazoo	)				
Holland	48	<b>3</b> 6	18	12	
Charlotte	} 36	24	24	6	
Hastings	500	-4	27	U	
Lowell	)				
Portland	<b>3</b> 6	24	12	6	
Greenville	)				
Alpena	48	36	6	3	
Muskegon	48	<b>3</b> 6	no renta	l but a 2‡	
		(	cent. per	call fee.	

These less than cost rates have secured a large increase among people not directly connected with commercial interests.

The growth of the Independent's or Citizen's Companies is owing largely to the following reasons:

First - Reasonable rates, regulated by franchise. (The Bell Company has no franchises regulating rates).

Second—Service far superior to that formerly given by the Bell Company and equal and often superior to that now given by the Bell, after rebuilding exchanges two, and in some cases, three times.

Three — More rapid development of local toll lines and at present a more complete State line system in the Lower Peninsula (except the southern tier of counties) than has the Bell Company.

Fourth-The knowledge by the people of the State that the independents are not only paying expenses, but dividends, so that as long as the independents are in the field, rates will remain reasonable and service be satisfactory.

The Independent Companies do not give free

As illustrating the accuracy of statements above the following table is given of the growth of the Grand Rapids Citizens' exchange, where no free service is given, and no solicitors have been employed for more than three years:

Date.	Telephones in service				
September 1st, 1896	1.460				
January 1st, 1897					
October 20th, 1897					
November 1st, 1898					
November 1st, 1899	3,064				
May 9th, 1900					

Numerous other cities and towns in the State can show equally satisfactory growth in their local or independent exchanges.

As showing the toll or State line advantages offered by the independents, the following list of exchanges and toll stations within fifty miles of Grand Rapids gives the number of telephones, both Citizens and Bell:

Citizens.

Bell-

Exchanges.

Exchanges.	Citizens.	Deile
Allegan	154	$^2$
Bangor		
Belding	116	17
Bloomingdale		0
Carson City		1
Casnovia	12	
Cedar Springs	54	1
Coopersville	23	1
Coral	11	0
Douglas		
Edmore		
Fellows		0
Fennyille	39	0
Fremont		
Ganges		
Glen		Ŏ
Gobleville		Ŏ
Grand Haven		
Greenville		
Hastings		
Holland		
Howard City	86	2
lonia	91	200
Kalamazoo		
Kalama		
Kibbie	45	0
Lake Odessa		
Lakeview		ī
Lowell		
Lyons		1
Middleville	58	<b>2</b>
Muir		1
Mullikan		0
Muskegon		
Nashville		2
Newaygo	24	ī
Otsego		ĩ
Plainwell		10

Rockford 52	1
Saranac 44	
Saugatuck	
Sheridan 12	
South Haven 175	
Wayland 32	
Whitehall 16	
Zeeland 42	1
Other toll stations 172	67
Total telephones	
within circle 4,441 2	,174

Total points reached - Citizens 218. Bell 90. Exchanges and toll stations reached exclusively by the Citizens' lines, 127; excess telephones

Summary (Grand Rapids Circle):

Exchanges 10 or more	Citizens.	Bell.
telephones		
Total points reached		

If all Eric property was consolidated against the Citizens' Company the result outside of Grand Rapids within the circle would be:

Michigan Bell New State Company Central—Kalamazoo	10° 5	14
Total Erie Citizens		
Citizens' excess	17	30

While the above is not a fair average for all cities in the State, yet equally good averages numerically can be obtained by using Saginaw Alma, St. John's, Traverse City, Cadillac, Muskegon, Allegan and Benton Harbor as centers for similar fifty-mile circles.

The selling of the Detroit exchange, the Kalamazoo exchange and toll line system (Central Telephone Company) and a majority of the New State Telephone Company stock (toll lines around Detroit) to the Erie Telephone Company in January and February, 1900, threatened, as was intended, to overthrow the independent movement of Michigan.

The telephones included in properties sold to the Erie Company were:

New State lines	4,30
(Total	1 076

Although negotiations for the properties progressed, no other sales were completed. As a result of this attempt to buy out opposition and in order to prevent the same, several sales and consolidations took place among the independents, the most important being the purchase by the Citizen's Telephone Company (Grand Rapids), of the Lansing property and a majority of the Muskegon Company's stock.

Recently a State contract for the interchange of business for twenty-five years, on a fair, equitable basis, has been entered into by companies owning eighty per cent. of the telephones in Lower Michigan, not controlled by the Erie Company, which contract also has, as one of the parties thereto, the United States Telephone Company of Ohio.

This insures long distance service, not only to Ohio, but to other States, and thus will be soon developed, that branch of the business in which the Bell Company has heretofore had the control-the Interstate Long Distance Toll business. What alliances or working agreements may be made with the Western Union or other companies cannot be stated, but with long distance business secured to the

Michigan Independents, the Bell Company's last great advantage will be overcome, and the final result is already open to speculation.

Before closing this article, certain information obtained from the sworn reports of the telephone companies, filed with the State for the year ending December 31, 1899, is presented. Each Michigan Company is required to show its gross income for 1899 from exchanges and toll lines.

The following list is selected from said re-

	Telephones.	Gross income.
Michigan Bell Co	32,231	<b>\$</b> 765,58,779
Detroit Telephone Co	5,200	161,247.57
New State Co		93,821.43
Kalamazoo Exchange	819	11,695,88
Central Co., Kalamazoo	413	18,403.25

The capital of the Michigan Telephone Company has been \$2,500,000 for several years, and the articles of association were not amended until in April last authorizing the issuing of \$7,500,000 more stock.

The bonded debt of the Michigan Company is \$5,000,000, bearing 5 per cent, interest. The Erie Company announced 11 per cent. dividends on the Michigan Telephone Company stock for 1899, so that the interest and dividends for one year on the bond and stock issue (December 31, 1899) would be 5 per cent. on \$7,500,000 or \$375,000.

It is of interest to note that in 1899 the gross income of this Bell Company was but \$765,000, or 10 per cent. (plus) of the stock and bond

Taking the average Bell telephones for 1899 as 26,000, the average income per telephone from both toll line and exchanges was but \$29.49 per instrument. The Citizens' Company's Grand Rapids plant has cost about \$80 per telephone. It has no bonded or mortgage debt. The other independent Michigan companies make as good or better showings, as to average cost, as a rule.

Can the Bell Company with an average issue of stock \$78 per telephone; bonds \$156 per telephone, and a total issue of \$234 per instrument (to say nothing of royalties, extraordinary expenses, or onerous contract conditions), be able permanently to compete with companies having but one-third the investment per instrument, and giving at least equally good service? If not, can it permanently do business in Michigan at a loss? These are the two questions that are most frequently being proposed among both telephone people and the public

With the Detroit, New State and Kalamazoo properties still being operated in connection with the independent lines, under twenty-five year contracts, and the lack of information as to just what policy will be pursued with said properties, other interesting questions arise which the writer does not presume to discuss at this time.

A few conclusions, however, the writer has reached, among them being that-

First-Reasonable rates are here to stay.

Second—Good service must be and will be maintained.

Third-The telephone development is only fairly begun.

Fourth-Exchange rates in Michigan will be regulated by local franchises, or by State legislation.

Fifth-It would seem from this review that only by an increase of exchange rates can the Michigan Company succeed financially, and such increase cannot be made permanently except by its again securing the monopoly of the State, which is an absolute impossibility.

Everything indicates the permanency of the independents in Michigan and their success financially is conceded.

# The Amended Cuban Tariff.

Under date of March 31, the Cuban tariff was amended, to go in force on the 15th of June. Under the terms of the new tariff questions arising in the administration of customs regulations are to be referred to the collector for the port of Havana, and from his decision there shall be no appeal unless the collector shall deem it expedient to ask the War Department for any special instructions.

Importers who shall not feel satisfied with the valuation or classification of merchandise as fixed by the collector shall pay the duties imposed, but they may file at the time of payment a written protest or appeal, in which they may state briefly the value or classification of the merchandise, which they claim should have been established. That protest and appeal will be transmitted by the collector, through the customs service, to the military governor of the island, and it will be his duty to review, and either affirm, reverse or modify the action complained of.

The rates on electrical instruments, accessories, apparatus, etc., are as follows:

Agriculture implements, propelled by electric power, 10 per centum ad valorem.

Acetylene apparatus, of metal other than copper, 20 per centum ad volorem.

Acetylene apparatus, of copper or its alloys, 20 per cent ad valorem.

Electrical apparatus for illuminating purposes, 20 per centum ad valorem.

Telephonic apparatus and telegraphic apparatus, 20 per centum ad valorem.

Scientific apparatus, including graphometers phonographs, hydrometers, etc., 25 per centum per valorem.

Automobiles, 20 per centum ad valorem.

Conducting cables for electricity over public thoroughfares, \$7.50 per 100 kilograms, gross weight, subject to a tare allowance of 13 per cent if imported in cases or barrels, or 7 per cent. if imported in hampers, and of 5 per cent. if imported in any other way.

By conducting cables for electricity is meant cables composed of one or more wires of copper or any alloy of copper, whatever may be their thickness, provided that they be covered with an insulating wrapper, without taking into consideration whether they are enclosed in pipes of iron or lead or strengthened with cordage or iron or steel wire.

Cables of wrought iron or steel, \$1 per 100 kilograms, gross weight.

Carbons prepared for electric lighting, \$3 per 100 kilograms, gross weight.

Carriages for street railways, 25 per centum ad valorem.

Signal disks, or wrought iron or steel, 80 cents per 100 kilograms, gross weight.

Dynamo electric machines, 20 per centum ad valorem.

Accumulators, 20 per centum ad valorem.

Insulators, of glass, \$1 per 100 kilograms, gross weight, subject to tare allowance of 30 per cent. if packed in cases or barrels, or of 20 per cent. if packed in crates or otherwise.

Insulators, of porcelain, \$5.80 per 100 kilograms, gross weight, but subject to a tare allowance of 30 per cent, if packed in cases or barrels, or of 16 per cent. if in hampers or otherIncandescent electric lamps, mounted or not.

\$2.50 per hundred.
Electric switches, 20 per cent. ad valorem.
Electric elevators, 20 per cent. ad valorem. Graphite, unwrought, 20 cents per 100 kilograms, gross weight.

Graphite, prepared, \$5 per 100 kilograms, gross weight, subject to a tare allowance of 10 per

cent.

Indicators, 20 per centum ad valorem. Inductors, 20 per centum ad valorem. Manganese, 10 cents per 100 kilograms, gross weight.

Motors, electric, 20 per centum ad valorem. Electric agriculture machinery, 10 per centum ad valorem.

This paragraph provides for these electric machines which are used by farmers and agriculturalists for preparing the ground and gathering the crops; also those employed in order to clean the crops and improve them without essentially changing their nature.

### "Phono-Electric"-The New Wire Conductor.

Engineers are showing great interest in a new wire called "Phono-Electric." This is an exceedingly high-grade wire and is admirably

fitted for telephone, telegraph and trolley use. "Phono-Electric" is perfectly homogeneous, both with mechanical and molecular structure

and does not depend upon a hardened skin for its strength as do other drawn wires.

A series of interesting tests were made on skin effect by removing successive strata from the surface of "Phono-Electric" wire, and its tensile strength was found to be uniform throughout the whole disparent. throughout the whole diameter.

Hard drawn copper wire was subjected to the same treatment, and it was found that once the skin is removed or injured in any way the strength of the wire is reduced to that of ordinary soft copper.

The perfect homogeneity of "Phono-Electric" wire gives it a tensile strength for the various sizes of wire from forty to forty-five per cent. greater than that of hard drawn conner wire

per cent. greater than that of hard drawn copper wire.

Equally important with tensile strength in a wire is the power of enduring severe strains without taking a permanent stretch, thereby weakening the wire for future emergencies.

A set of comparative tests shows that "Phono-Electric" has an elastic limit forty per cent. greater than that of hard drawn copper wire. This high elastic limit is of great value, and gives a security and permanence to value, and gives a security and permanence to the work that no other material will. Only steel can resist strains better, and steel is a vastly worse conductor, and also subject to

"Phono-Electric" is a remarkably tough wire. This toughness enables it to resist bending, kinking, wrenching, sudden blows, and slow distortions without giving way. In electrical work the trolley wire comes in

for hard service. At turnouts it often comes in for hard knocks from the trolley, all sorts of pounding and wrenching, to say nothing of occasional vicious arcing at curves and frequent heating from overloads and short circuits.

To stand up successfully under such a test, the trolley wire must not only be strong, but must be tough and ductile, and retain these properties under all the severe conditions of service. It constantly happens that the passage of the trolley wheel is accompanied by small arcs set up betweeen wheel and wire. These burn and roughen the wire and anneal parts of its surface. If the wire is ordinary parts of its surface. If the wire is ordinary hard drawn copper, the hardened skin is de-stroyed, and the wire thus weakened rapidly succumbs.

This is the secret of the breaking of trolley

wire at curves where there is heavy service, areing being established by the flange of the trolley wheel.

"Phono-Electric" is free from this serious difficulty, for it does not maintain an arc readily. Its fusing point is high, and it does not furnish enough metallic vapor to keep an

arc going.
"Phono-Electric" does not rust or corrode for trolley wire on hard use, for long and difficult spans, and for telephone and telegraph lines in exposed and troublesome places it stands unrivaled.

# THE TELEPHONE WORLD.

#### A Valuable Property.

The Telephone, Telegraph & Cable Company of America, says the Boston "News Bureau," was pretty well informed regarding the telephone situation and value of the Erie property when it purchased a controlling interest in the stock of the company in February last.

In a circular letter of Messrs. Wilson & Stephens of New York an interesting letter from President Charles J. Glidden is published giving valuable information in regard to the company as follows:

The Erie Company owns a majority of the stock of the following operating companies: The Cleveland Telephone Company, the Northwestern Telephone Exchange Company, the Southwestern Telegraph & Telephone Company, Michigan Telephone Company and Wisconsin Telephone Company.

These operating companies have the exclusive and perpetual right to operate in their respective territories under the Bell patents and to enjoy, besides, the use of the long distance lines and those of neighboring Bell companies. The territory covered is as follows:

County of Cuyahoga, Ohio, including the City of Cleveland; Minnesota (excepting only Duluth), North Dakota, South Dakota (excepting only the Black Hills), Texas, Arkansas, Michigan, Wisconsin.

The estimated population of the territory embraced as above is 12,000,000, or about one-sixth of the entire population of the United States,

# Opposing the Bell Company in Missouri.

Articles of incorporation of the Kinloch Long Distance Telephone Company of Missouri were filed with the Secretary of State at Jefferson City on June 7.

This means that the Kinloch Telephone Company is about to enter the field against the Bell Company in the long distance service.

For the present the competition will be confined to towns in the States of Missouri and Illinois.

Work is to be commenced immediately on the line. Connections will be made with St. Charles, Mo.; Alton, Ill.; Belleville, Ill., and other nearby places. Small telephone exchanges will also be established in these towns.

The directors of the long-distance company are largely the same as those of the local company, and the stockholders are almost identical so that the two concerns are practically one institution.

Vigorous efforts are being made by the State Telephone Company to gain a foothold in Plainfield, N. J., in order to compete with the New York and New Jersey Telephone Company. An application was made by the company to the North Plainfield Borough Council recently for a franchise to string wires and operate a telephone system in the borough. The company agrees to lease telephones for house service, unlimited, for \$24 per year, and for business houses for \$36 per year—a reduction of 50 per cent from the rates enacted by the New York and New Jersey company for the same service. The new company will build a line connecting all the towns of Union, Somerset, Middlesex, Essex and Morris Counties.

A consolidation of some of the telephone companies in New York State is said to be pending. The companies affected are the Hudson River (Bell) Telephone Company and the Northern New York Telephone Company. The latter, which is an independent concern, was recently taken into the control of the Hudson River, and it is now announced that the Troy Telephone & Telegraph Company will be the next to be absorbed. The capital stock of the Troy Company is \$250,000, Last March authority was given to increase the stock of the Hudson River Company from \$2,000,000 to \$8,000,000. This increase, it is now said, was for the purpose of consolidating some of the independent systems in its territory. So far only \$250,000 of the new \$1,000,000 of stock has been issued.

Petitions are being circulated in Independence, Coffeyville and Cherryvale, Mo., for signatures which will be presented to the city council of Kansas City, Mo., shortly, asking for a franchise for the Hickman-Perkins Telephone Company to operate in Kansas City. This telephone company operates in many points in Southern Kansas and the object of asking for the franchise is to give this section of Kansas direct telephone connection with Kansas City. If the franchise is granted, it will connect Kansas City with several points in the Indian Territory, including Bartlesville, as well as Southern Kansas towns.

Superintendent Wilde of the southern division of the Michigan Telephone Company is securing bids for the erection of an exchange building at Battle Creek similar to that being installed at Kalamazoo, Mich. It will be two stories high, built of pressed brick with stone trimmings, and equipped with a modern switchboard.

#### Boston & New York Telephone Company.

The annual meeting of stockholders of the Boston & New York Telephone Company was held in Dover, Del., recently. The following board of directors was elected: Churles E Adams, Oakes Ames and Frank A. Cutting, of Boston; W. H. Eckert and H. E. Gawtry, of New York; William F. Hall stead, Secanton, Pa.; Z. Swift Holbrook, Boston; William J. Latta, Philadelphia; Martin Maloney, New York; Joseph B. McCall, Philadelphia; Charles W. Morse, New York; Arthur S. Temple, Boston; Frank Tilford, New York; James L. Wolcott, Dover, Del. The officers of the company are: President, Charles E. Adams; secretary, John B. Stauffer; treasurer, Oakes Ames.

President Adams in his annual report said: "During the past year a large amount of preliminary work has been accomplished for the establishment of a telephone exchange in Boston and other cities and towns in Massachusetts, together with the construction of a toll line between the cities of Boston and New York. Contracts for over 5,500 subscribers, covering a period of five years, to the exchange system, now under construction in the city of Boston, have been received. The underground work has been constructed with a view to permanency and over 100,000 feet of duct has been laid up to the present time in the business section of the city, which will enable the connecting of a large number of subscribers with the main exchange in an expeditious and economical manner.

"Rights of way have been secured from Boston to New York for the purpose of building a toll line. We have secured telephone franchises and rights of way in 55 cities and towns in Massachusetts, and a model exchange has just been constructed in Stoughton, Mass, which will be followed by other telephone plants in communities adjacent to the city of Boston. The establishment of a telephone business as contemplated by the Boston & New York Telephone & Telegraph Company requires, for present construction and future growth, a very large expenditure of money, but every financial emergency has been met, and the business energy, together with the strong aggregation of capital that has been added to the company's resources during the past year, makes the possible future look even more satisfactory than the most enthusiastic in the early history of our company predicted,"

A dispatch from Detroit, Mich., states that a number of physicians are behind a movement to organize a telephone system in Detroit for the especial benefit of doctors and druggists, who feel indignant at the treatment they are getting from the telephone company. The enforced use of nickel-in-the-slot machines in drug stores has stirred up a great deal of dissatisfaction, and the service is bad in other ways. About 70 physicians have signed an agreement to take out their 'phones when 350 signatures are obtained. One prominent physician says an independent exchange with about 1,200 subscribers could be built and operated economically. The plan is to limit the subscribers to physicians, druggists, hospitals, livery stables, and perhaps undertakers. An offer of backing for any sum required to establish a plant is said to have been received.

The business men of Worcester, Mass., have formed a company to be known as the Citizens' Telephone & Telegraph Company, and will incorporate under the laws of Massachusetts with a capital stock of \$300,000. The men interested will petition the city council for locations for underground conduits, and the necessary poles and conveyances for the lines. Henry S. Pratt, president of the Ware-Pratt Company is at the head of the new corporation, and the directorate includes a number of the best known business men of that city It is the intention of the incorporators to join forces with the independent long distance company, which has petitioned for a right of way through the city, so far as long distance service is concerned, although at present they claim no affiliation with other companies. It is proposed to give service equal to if not better than that furnished by the old line company, and at a greatly reduced rate.

The Citizens' Telephone Company of Houston, Tex., is preparing to make extension of switchboard facilities and cables. In fact, part of the work is already under way. This is made necessary by the large number of subscribers already booked and others who are asking for telephone service. The company is also preparing to issue a new directory which will contain many new names.

In the Senate recently Mr. Proctor, from the Committee on the District of Columbia, reported the bill incorporating the Washington Telephone Company. He stated that he wished to report the bill "without comment."

The telephone line from Milton to Bedford, Ky., is said to be a certainty. The work of setting the poles is now progressing. Advices from Rochester, N. Y., state that the striking Bell Telephone linemen have succeeded in preventing the company from bringing in new workmen. Up to date sixty new men have been imported, but they have about all joined the strikers as soon as they learned the situation. The Rochester Telephone Company, an independent corporation, was recently organized there, and the linemen say they can get plenty of work with the new company. The rivalry between the old and new telephone lines is intense, and the strike may cripple the Bell people's service.

Major Boone, traveling superintendent of the Southwestern Telephone Company, was in Wharton, Tex., a short time ago on business connected with the extension of his company's system, and is reported as saying: "My company just now is paying particular attention to the coast section of the State. As fast as your railroad lines are built, we will follow them and in some instances go ahead. I am charged to hasten the work on a local exchange in Edna, Jackson County. We are putting in a long distance line between Gregory and Rockropt."

The directors and stockholders of the Hudson Telephone Company met recently in Jersey City and elected the following directors: Judge John A. Blair, William J. Davis of Kearny, Lewis Wood, Philip Martin, A. L. Angle, Henry C. Vance, Jr., Clement J. Walker, Edwin Brooke and Arthur W. Deas. About two-thirds of the whole stock was represented at the meeting. The company declares itself to be free and independent from the Bell Company and intends remaining so. The reports of both secretary and treasurer showed increase in both subscribers and receipts.

An important meeting of telephone men was held in Boston recently. There were present: Chas. J. Glidder, president of the Erie Telephone system; Wm. A. Jackson, president of the Central Union Telephone Company; Jas. E. Caldwell, president of the Cumberland Telephone Company; A. Burt, general manager, and F. F. Rozzelle, general counsel of the Missouri & Kansas Telephone Company; Arthur D. Wheeler, general counsel of the Chicago Telephone Company. Although nothing could be definitely learned as to the nature of the meeting, it is generally understood the independent telephone situation was carefully gone over.

The Pennsylvania Telephone Company at Reading, Pa., is placing 14,282 feet of cable in conduits, to take the place of overhead wires on a number of streets in that city. When these cables are all connected, the company will have about ten miles of underground cable within the city limits. The company has also commenced the construction of a line from Womelsdorf to Newmanstown, Pa. The latter will be connected with the Reading exchange on the pay station basis.

The Eric Telephone system made a gain of 2,939 subscribers during the month of May. The total number connected to May 31 was 123,711, and the number waiting connection 5,939.

The citizens of West Caton, in Steuben County, N. Y., expects soon to be connected with Corning, N. Y., and the rest of the world by telephone. Work has already been commenced on the line.

A decrease of 4,565 instruments in the net output of the American Bell Telephone Company for the month ended May 20 makes a decrease of 20,014 since December 1.

The telephone companies are having their wires placed in subways throughout the city of Yonkers, N. Y.

The Lineville Telephone Company of Princeton, Mo., has filed a statement showing increase of capital stock from

## TELEPHONE INCORPORATIONS.

The Indian Territory Company of New York, Philadelphia and Texas—to build railroads, telegraph and telephone systems. Capital stock, \$5,000,000.

The Missouri Interstate Telephone Company, Kansas City Mo.—to operate a telephone system. Capital stock, \$500,000. Incorporators: D. J. Dean, J. R. Crowe and L. C. Boyle of Kansas City; W. B. Hurst, C. W. Penniman and G. Hornaday of Fort Scott, Kan.

The Salamanca Telegraph & Telephone Cempany, Salamanca, N. Y. Capital stock, \$10,000. Incorporators: C. R. Gibson, L. W. Gibson, E. Bolard, C. S. Fish, all of Salamanca.

The Excelsior Telephone Company, Wills Point, Tex. Capital stock, \$6,000.

The Marion County Telephone Company, Marion, O. Capital stock \$50,000.



## COMMERCIAL PARAGRAPHS.

W. C. Sterling & Son of Monroe, Mich., the oldest cedar firm of to-day, report business in their line as being the best it has ever been. They are shipping telephone poles to all parts of the country, and have a well established business because of their filling their orders to please their customers They are also shipping cedar ties to several electric roads and have contracts for several hundred thousand. eleven sorting and manufacturing cedar yards in Michigan, they are always in position to get cars and rush shipments.

In the exhibit of the Ericsson Telephone Company at the Cleveland Convention, Room 215, Electric Building, we are informed they make a fine display of instruments, both imported and American patterns, made with Ericsson Talking Circuits and American wood work and magneto. Among the imported instruments is the portable testing set, of which we show cut, which is a very handsome set, and particularly adapted for use when extending lines or at terminal stations. They also show an imported metallic circuit switchboard, which we are told will be connected up so that connections can be made through this switchboard, and will enable their visitors to use their make of instruments. Among the installations of L. M. Ericsson & Co., Stockholm, Sweden, we give particulars of some of the larger,



ones as it will interest our readers, particularly as the Ericsson Telephone Company are U. S. A. representatives of the Stockholm firm. The largest single switchboard room in the world is located at Copenhagen, Denmark, and the board installed has a capacity of 10,000 subscribers. There is a second floor in which an additional board is now being operated, having a capacity of several thousand subscribers. In Sweden many thousand instruments are in use, and in Stockholm are several large switchboards, in the central (primary) exchanges, besides, numerous small boards in the smaller cen trals and in the outlying cities and towns In Bergen, Norway, is an exchange of 3,000; one at Trondhjem only partly (900) installed; Arendal, 400, ultimate capacity 1,000; Christiansand, two of 400 each, ultimate capacity 1,000 each; Drammen 600, ultimate capacity 3,000. In Helsingfors, Finland, is a large board, capacity 8,000. In Wiborgh, 3,000; Abo, 3,000; Wasa, 1,800; Tammerfors, 3,000; Bjorneborg, 1,000. In Holland are two exchanges, at Groningen, 3,000; Utrecht 3,000. In Russia Ericsson has a branch factory in St Petersburg. Among other installations there are Charkow, 3,000; Riga, 3,000; Kasan, 1,800; Libou, 1,000; Rostoff-on-Don, 3,000; Sebastopol, 1,800; Tiflis, 3,000. A new modern board for 5,000 numbers will soon be installed in Kieff. In England Ericsson has supplied the National Telephone Company a large number of instruments, also numerous multiple switchboards. In Africa three exchanges, respectively, Cape Town, 3,000; Port Elizabeth, 1,500, and Pietermaritzburg, 1,500. To the Australian Government Ericsson has delivered telephones in thousands for years. In Shanghai will shortly be installed a board of 5,000 capacity. At Alexandria, Egypt, one of 400, ultimate capacity 1,000. In Java one of 600, ultimate capacity 3,000. In Valparaiso, Chili, 800, ultimate capacity 3,000; Lima, Peru, 900, ultimate capacity 3,000.

## Minute Telephone Rates.

The Northwestern Telephone Exchange Company recently put in effect minute rates from Minneapolis to all stations on its lines in Minnesota and the Dakotas. A few months ago as an experiment a minute rate was made from Minneapolis to Fargo, Grand Forks and a limited number of other points in North Dakota, and the rate having proved popular, through reducing the cost of short time messages, it has been decided to extend it to the stations reached directly by the Northwestern lines. It is claimed that fully 75 per cent. of the business telephone conversations can be kept within one minute if the individual talking will measure words, observing brevity and confining the conversation strictly to business.

# GENERAL NEWS.

ELECTRICITY.

What is Going On in the Electrical World.

#### LIGHTING.

Adairville, Ky.—W. C. Potter of Memphis, Tenn., will prepare plans and specifications for an electric light plant for this city.

Ashland, Ill.—The citizers here have decided to erect a municipal electric lighting plant.

Astoria, Ore.—The question of building and operating an electric light plant is being discussed here.

Fairport, N. Y.—The citizens of this place voted a short time ago to install an electric light system.

Fairmount, W. Va.—B. K. McMechen, of Wheeling, has purchased from S. L. Watson and others the plant of the Fairmount Electric Light & Power Company, and proposes making an outlay of \$25,000 at once to increase its size and to care for the growth of the business. An electric road to be erected in connection with the increase its size and to a propose of the deal. this is said to be another feature of the deal.

Jefferson City, Mo.—The present contract for lighting the city expires in the fall and the council is preparing to enter into another contract. The city burns at present 38 arc lights, 2,000 candle power. Address A. P. Grimshaw, mayor.

Kansas City. Mo.—An ordinance has been introduced in the city council which provides for the issuance of \$125,000 in bonds for erecting or purchasing an electric lighting plant.—The Kansas City Electric Light & Power Company has arranged to have its electric light wires put underground. The work will be completed by September 1 at a cost of \$210,000.

Mount Ayr, Ia.—The people here are considering the advisability of installing an electric light plant.

New Hartford, N. Y.—This village is to have electric lights. The Utica Electric Light & Power Company has made application for a franchise here.

Oskaloosa, Ia.—This city is inviting bids until July 2 for lighting the streets for a term not exceeding 15

Pittsburg, Pa.—Plans for the new electric light plant to take the place of the present one are being prepared. None of the machinery in the old plant is to be used. Peoris, Ill.—H. W. McCoy. G. B. Franks and W. Barker are interested in the Hammond Gas & Electric Company of this city, which has lately been organized with a capital stock of \$10,000 to operate light, heat and power plants.

Santa Cruz, Cal.—J. F. Cooper recently established the Big Creek Electric Power Company at Big Creek, fifty miles north of here. The company's idea is to light not only this city, but furnish power and lighting

St. Cloud. Minn.-The electric light plant at the dam in this city is to be rebuilt at a cost of \$30,00

Verons, N. J.—At a recent election held here to decide for or against further lighting of the streets with electricity, the verdict was strongly in favor of the

Waterloo, Ind.—H. K. Leas, J. P. McCague, M. Kiplinger and A. Kelly are interested in a concern recently formed here, known as the Waterloo Electric Light & Power Company.

Waynesville, N. C —This city is considering the construction of an electric light plant for which bonds have been issued.

Winona, Minn.—It is understood that the Northwestern officials are planning to put in an electric light plant at the shops in this city.

# STREET RAILWAYS.

Cleveland, O — The Portage Lake Traction Company of this city was lately incorporated for \$10,000 by D. M. Glasscock, C. H. Nau, H. Lancefield and C. L. Stocker, to build and operate an electric line between here and Ravenna and Kent, Portage County.

Fall River, Mass.—A new electric railway is planned between Providence and this place. J. T. Shaw of Brookline, Mass., is the largest stockholder.

Harrisburg, Pa -Capitalists of this city are interested in a project to run a trolley line from Carlisle to Mt. Holley Springs via Craighead, Mt. Zion and Hatton.

Huntsville, Ala.—When the deal involving the transfer of the Belle Factory property to northern manufacturers is closed, the Nashville, Chattanooga & St. Louis Railway, which runs from here to that place, will be electrically equipped and electric cars will unite this city with its big suburb.

Lancaster, Pa.—William F. Sadler, Jr., secretary and treasurer of the Trenton, Lawrenceville and Princeton Railroad Company, was in this city a short time ago in the interest of a New York syndicate, which intends to erect a number of trolley roads throughout the county.

Libertyville, Ill.—The Secretary of State recently licensed the incorporation of the Chicago, Fox and Geneva Lakes Electric Railway Company, with its principal office here. The road is to be constructed from a point on the east line of Lake County, Ill., to a point in McHenry County on the State line between Illinois and Wisconsin. The capital stock is \$100,000.

The incorporators are F. V. Bissell of Oak Park, Ill., C. Cunningham, C. A. Hill, K. S. Holmes and A. A. Patterson.

Little Falls, N. Y.—The proposed electric road from this city to Utica has received new life within the past week. The Hon. Silas B. Dutcher of Brooklyn will make an attempt to finance the scheme.

Little Rock, Ark.—The Little Rock Traction & Electric Company will expend about \$100,000 in betterments, repairs, and reconstruction of a large portion of its lines. J. A. Woodson, president, 414 West 2d street, Fleming Building.

London, O.—The county commissioners have granted a 25 year franchise to the National Traction Company of Phoneton, Miami County, which will build an electric line along the national pike from Columbus to the Indiana line.

Milton, Ind.—An electric road may be built from here to Economy, through Cambridge City and Hagerstown. The new line will intersect the road to be extended from Greenfield to Richmond.

Newcastle, Pa.—The project of an electric line between this city and Youngstown has been revived by a company that has already secured the right of way almost the entire distance.

New York City.—The storage battery electric system is to be put into service on the Thirty-fourth street cross-town line of the Metropolitan Street Railway Company

North Creek, N. Y.—There is a report that capital-ists are considering the question of building an electric line to connect with the Adirondack railroad at this place, and extend through Minerva and Newcomb to Long Lake, Hamilton County.

Savannah, Ga.— The city council favors granting a franchise to the Vernon Shell Road Company to build its proposed trolley line in this city. Messrs. Twiggs & Oliver are the company's attorneys.

Scranton, Pa.—The Northeastern Railway Company, for which letters patent were recently granted in Harrisburg, is to build an electric railway between this city and Wilkes-Barre.

Toledo, O.—The Victory Park Railway Company was lately incorporated with \$50,000 capital, by Chas. W. Ryan, J. William Ryan, John D. Besey, Frank J. Buckle and Frank W. Coughling, for the purpose of operating an electric railway on Put-in-Bay Island.

Worcester, Mass.—A plan is maturing which may end in the establishment of a continuous electric street railway system from Putnam, Conn., to this city. The Webster and Dudley Company is connected with the

# MANUFACTURING.

Elizabeth, N.J.—A new concern, known as the Hercules Motor Company has been formed here to manufacture and deal in electrical apparatus. Among the incorporators are Charles G. Blies, William I. Hester, Brooklyn, and J. C. Warner, of Newark.

Newark, N. J.—The Electric Tripartite Steel Pole Company of this city, with a capital of \$100,000, was recently formed to manufacture posts for electric railways. Washington E. Page of Franklin, Samuel C. Martin and George V. A. Conger of Belleville are all interested in the concern.

Paris, Ky.—The Power Grocery Company is interested in a proposed street car line, and wishes to correspond with car builders and material dealers. H. A.

Trenton, N. J.—The Storey Motor Company is unable to secure the help needed to conduct its business here, and will remove to Harrison, N. J., as the company believes that it will be able to secure mechanics from New York when the works are nearer the metropolis. Last week its authorized capital stock was increased to \$3,500,000. The concern manufactures electric and pneumatic machinery, and has a large export trade. port trade.

# COMPANY MATTERS.

Boston, Mass.—Holbrook, Cabot & Daly of this city, have received the contract to build the new electric power plant which the Ludlow Manufacturing Company is to erect at Red Bridge.

pany is to erect at Red Bridge.

Shelton. Conn.—The Consolidated Railway, Electric, Heating, Lighting & Equipment Compus is a new corporation here, and is made up of a number of relatively smaller companies, which have consolidated and are as follows: Columbian Electric Car Lighting Company, American Railway Electric Light Company, United Electric Company, National Electric Car Lighting Company, European Railway Electric Lighting Company, Lindstrom Lever Brake Company, Railway Triplex Ticket Company and Syracuse Battery Company.

# POWER AND TRANSMISSION PLANTS.

Lockport, N. Y.—Charles E Dickinson, president of the Franklin Mills Company, purchased the old Chester mill site on Race street a short time ago, which is con-sidered one of the very best power sites in the country. In course of time it is expected to be transformed into an electrical plant from which power for manufactur-ing purposes, lighting, telephones, etc., will be sup-plied.



# **ECTRICA** SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of source The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., attension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mig., mortgage; tr., trust; A., annually; S., semi-annually; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

Ibany, N YJune 9.							PASSE	NG	ER R	AILW	AYS.		
		Capital	Stock.	1					Capital Stock.				
Pane:	Par	Authorz'd	Issued.		Bld.	Asked.	Name.	Par	Authorz'd Issued.		Bate and Date of Last Div.	Bid.	Anked
Albany, N Y June 9. United Traction	100	<b>\$</b> 5, <b>000,00</b> 0	\$5 000,000	1 <b>% % Q.,</b>	124	125	Hartford Conn.—June 9: Hartford Street Ry. Co	100 100	\$4,000,000 1,000,000	\$200,000 247,000	8 % S., Oct.,	150	=
Troy Oity Railway.)							Holyoke Mass.—June9. Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	2073.	312
Allentown Pa.—June 9:					ŀ		Hoboken, N. JJune 9.	i		-			
Allentown & Lebigh Val. Trac. Co.		4,000,000	1,500,000	*********	-	15	North Hudson Co. (N. J.) By. Co	25	1,250,000	1,000,000	8 <b>%</b> ,	150	-
Brilgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	103		Indianapolis, Ind-June9.	ļ	5,000,000	5,000,000	*****	24	24 %
Baltimore Md.—June 9: a United Rail ways & Elec. Oocom.	50	24,000,000	18,000,000	***************************************	181/4	181/	Lancaster, Pa.—June9 Pennsylvania Traction Co Lancaster & Cel. Electric By		10,000,000	9,900,000 <b>87</b> ,500		=	=
Boston, Mass.—June 9; New England Street By North Shore Traction Cooom. North Shore Traction Copfd. b West End Street By. Co oom. West End Street By. Co % pfd. Boston Elevated B. R.	100 100 50	4,000,000 2,000,000 10,000,000 5,400,000	4,000,000 2,000,000 9,085,000 6,400,000	6 % S., A. & O. 8% % S., Oct., '19. 4 % S., Jan.	15 85 98 112 139	16 87 94 114 140	Louisville, Ky.—June 9: Louisville By	100	4,000,000	8,500,000 2,500,000	1½ %., April. 2½ % 8., Oct. 1,	78 110	79 111
Brooklyn N. YJune 9: Brooklyn City Ry	100	200,000 12,000,000	48,000,000 200,000 12,000,000	8% % Q., Jan.,	229 €95 107 237	270 6934 109 289	Twin City Rapid Transitcom Twin City Bapid Transit		8,000,000 4,000,000	1,712,200	1½ %, Oct. 8 % S., M. & N. 1½ % S., J. & J.	260 1003/	187
aBrooklyn, Queens Co. & Sub. RR. Coney Island & Brooklyn RR. Kings County Elevated	100	2,000,000 4,750,000	1.884.200	2 % % Nov., 99	820	825	Memphis Tenn.—June 9: Memphis Street Railway Co	100	500,000	<b>500,0</b> 00	***************************************	25	_
Nassau Electric Railroadpfd. †Atlantic Avenue Bailroad gBrooklyn, B. & W. E. Railroad	50	6,000,000 2,000,000	6,000,000 2,000,000	**********	75	80	New Haven, Conn. – June 9: Fair Haven & Westville RR New Haven Street Railway Co	25 100	1,250,000	2,000,000 1,000,000	8 % S., Fept. 2% % A., July	89	41
Buffalo N. Y.— June 9. Buffalo & Niagara Falls Elec. Ry *Buffalo Bailway Co				1 % Q. Dec., 99	74 99	75 100	New Haven & Centerville	32		000,000	•••••	45	46
Co.umbus OJune 9: Coumbus Street Railroad Co:umbus Street Hailroad, pfd	100				25 &8	28 88	Canal & Claiborne RR. Co	100 100	1,200,000	••••••	4 % S., July, 1% % Q., Oct.	148 ½ 22 ½ 95 20 ½	96
Charleston, S. C.—June9 Oharleston City Ry. Co	50 26				::	::	Orleans RailroadSt. Charles Street Railway	1 168	2,000,000 500,000	2,000,000 185,000 1,000,000	8 % S., Jan., 4 % S., Jan., 1 % %., June, 1 % %. Oct.,	5634	52
Clicago, Ill.—June 9 Chicago City Ry. Co. Colcago & South Side R. T. RR. Lake Street Elevated RR. Metwopolitan West Side Elev. Ry. Met West Side El., pfd North Chicago Street RR. ANorth Chicago City RR. South Chicago City Rallway. West Chicago St. RR. Co. Union Traction Ry. Union Traction Co. pref.	100 100 100 100 100 100 100	10,823,800 10,000,000 15,000,000 15,000,000 10,000,000 2,000,000 2,000,000	10,828,800 10,000,000 7,600,000 9,000,000 6,600,000 249,900	Feb 28 1900.  8 % Q., Jan.  1½ % Q., Feb. 35 %	252 	25 801/2 215	New York—June 9: Central Crosstown RR. cChristopher & 10th Sts. RR. guar Dry Dock, E. Brdw'y & Battery RR. dMetropolitan Street Ry. Co., cBleecker St. & Fulton Fy. Ry. guar /Broadway & Seventh Ave guar gOen. Park, N. & E. Rivers RR. guar hAlighth Avenue RR. 122d St. & Grand St. Ferry RR. guar jNinth Avenue RR guar rTwenty-third St. R. R. Co guar rTwenty-third St. R. R. Co guar	100 100 100 100 100 100 100	750,000	748,000	13 % Q.	270 178 100 165½ 86 280 99 855 895 198 203 400	87 240 201 400 410 205 210
Cincinnati, Ohio.—June 9: Oincinnati Inc. Plane Byoom. Cincinnati Inc. Plane Bypfd. Cincinnati, Newport & Cov. St. By. IGincinnati Street By. Co	50 50 100 50	1,000,000 150,000 8,000,000 18,000,000	575,000 150,000 8,500,000 14,000,000	% % Feb. 2% % Feb. 1% % Q., Jan. 1% % Q., Jan.	76 124 S	96 12)	Third Avenue RR.  11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	100 100 100	2,800,000 2,000,000	2,000,000 2,000,000	***********************	198 1:8 £0 190	4(5 201 118 1/8 60 200
Mt. Adams & Eden Park Inc. Ry. Cleveland, Ohio June 9: Arron, Bed. & Olev. Elec. By. Cleveland City Ey Cleveland Electric By	100	1,000,000	1,000,000 7,600,000	1½ % Q., Jan. 34 % Jan. 3-5 % Jan. 34 % Q., Oct., '99.	48 100 87	50 101 87大	Consolidated Traction Co. of R. J North Jersey Street Railway Co. United Electric Co. of New Jersey Pittsburg, Pa.—Ju ne9: Allegheny Praction Co	100	504,000	6,000,000 504,000	11% % 4.	57 27 28 ×	56
Detroit, Mich.—June 9: Detroit Citisens' Street Ry Ft. Wayne & Belle Isle Ry Rapid Railway Co Detroit Electric Railway Wyandotte & Detroit River Ry	100	2,000,000 250,000 1,000,000	1,250,000 1,200,000 250,000 1,000,000	************	100 ½ 175 90 	i00 i10	oConsolidated Traction Cocom. Consolidated Traction Copfd. pCentral Traction Co qCitizens' Traction Co rDuqueene Traction Co sPitisburg Traction Co Fedural St. & Pleasant Valley Ry.	50 50 50 50 50 50 25	15,000,000 9,478 850 1,500,000 8,000,000 8,000,000 2,500,000 1,400,000	15,000,000 9,000,000 [900,000 18,000,000 1,900,000 1,400,000	2 %, Jan. 8 %, Nov. 1 % % Nov. 6 % A. 6 % A. 8 %, Nov. 2 %, July, 2 %, Aug. 1 %, Oct. 5 % A., June J. & J.	26 (3)/2 69 12)/4	70
Dayton O.—June 9. City Railway Cocom. City Railway Copfd. People's Street Railway	100	1,500,000	1,470,600 600,000		140 170 114	145 115	Pgh., Allegheny & Man. Trac. Co P'tisourg & Birmingham Trac. Ry Pitisburg & West End Ry United Traction Cooom. United Traction Copref.		8,000,000 1,500,000 18,000,000 17,000,000 8,000,000		2%, Aug. 1%, Oct. 5% A., June J. & J. J. & J.	41 14 518/8	1434

\*Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltiu ore. The pref stock of U.R. & Eec. Co. has been issued in the form of income bonds. b Leased to B ston Elevated Railroad Company.

o Owned by Brooklyn Rapid Transit Company.

d Leased to B ston Elevated Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hst. Co. f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR. g Owned by Atlantic Ave. RR and leased to Nassau system.

A 300 per share on outstanding capital paid as rental by lessee—West Ohicago St. RR. Co.; \$250,100 of stock owned by North Chicago Street Railroad Company.

oontrols by lesse Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Company.

155 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company.

Majority of stock owned by Ohicago West Division Railway Company; \$20 on \$1,000.

Stock guaranted by West Chicago Street Railroad Company.

Majority of stock owned by Ohicago West Division Railway Company; \$2 on \$1,000.

On stock guaranted by West Chicago Street Railroad, assuming its bends.

\*Unlisted. † Full paid. | Outstanding. † Ex-div.
a Leased to New Orleans Traction Company at 5 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
c Leased to Central Crossfown Radiroad at 8 % on stock and interest on bonds.
d Operating the former Med. Trac. system, that corporation having become extinct.
c Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Ry.
f Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.
i Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.
i Leased to Metropolitan Street Railway for 18 % on stock
i Leased to Metropolitan Street Railway for 18 % on capital stock.

Controlled by Third Avenue Railway for 18 % on capital stock.
m Controlled by Third Avenue Railway for 18 % on capital stock.
c Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.
p Leased to Consolidated Traction Company for 8 % per annum on ar value of stock.
r Leased to Consolidated Traction Company for 8 % on espital stock.
s Leased to Consolidated Traction Company for 6 % on espital stock.
s Leased to Consolidated Traction Company for 6 % on espital stock.

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# PASSENGER RAILWAYS.

# TELEPHONE AND TELEGRAPH COS.

		Capital	Stock.	Page and Date of					Capital	Stock.	Data 1 To		
NAME.	Par	Authorz'd	Issued.	Bate and Date of Last Div.	Eid.	Asked.	NAME.	Par	Authorz'd	Issued.	Bate and Date of Last Div.	Bid.	Anke
New Bedford Mass-June 9 Union Street Railway 00				2 %, Feb.	160	165	Boston, Mass.— June American Bell Telephone Co Eric Telegraph & Telephone Co New England Telephone Co	100	50,000,000 10,894,600	28,650,000	4% % Q., Jan. 1 % Q., Feb. 20, \$1.50 p. sh. Feb	305 100 188	806 102 185
Northampton Street Rv Omaha, Neb June 9:		800,000	228,000	4 % A., June.	170	178	New YorkJune 9 American Telegraph & Cable Co	100	14 000 000	14 000 000	1240	91	0,
Omaha Street Ry	100	5,000,000	5,000,000	8 % A. and N.	55	65	*Central & South Am. Teleg. Co	100	6,500,000	6,500,000	1½ % Q. 1½ % Q. 1½ % Q. 1½ % S. 1½ % S. 1½ % Q. 1½ % Q.	104	106 170
Paterson Ry. Co	100	1,250,000	1,250,000	***************************************	54		Franklin Teleg. Co2½ % guar. Erie Telegraph & Telephone Co *Gold & Stock Telg. Coguar. 6 %.	100	1,000,000 5,000,000	4,800,000	1% S. Feb.,	112	118
Providence, R. I.—June 9: United Traction & Electric Co	100	8,000.000	8,000,000	3/4 %, Oct. '98.	109	111	*International Ocean Tel Co.guar 6% Mexican Telephone Co	100				118 116 2	128 118 21/4
Philadelphia June 9		2,000,000	1 770 000	2 %, Dec. '\$9.	28	24	*New York & New Jersey Tel. Co *Pacific & Atlantic Telegguar. 4 % *Postal Telegraph Cable Co		5,000,000 2,000,000	8,728,000	2% % Q., Jan., '99. 2 % S. 1 % Q.	10	21/4 174 75
Fairmount Park Trans. Co\$50 pd destonville, Man. & Fairmount Hest'nvl'e, Man. & Fairm't6 % pfd	50	1,966,100 588,900	11,986,100 1588,900	2%%, July 15, '99. 8% S—July, '99. 3% Feb. 1, '99.	47	48 76	*Sout'n & Atlantic Telg. Co.guar. 5 %   †Commercial Union Telegraph Co	100 25 25	15,000,000 950,000 500,000	559,525 500,000	2½ % S. 8 % S., Jan., '99.	95	100
aFairmount Pk. & Had. Fass. By	50	80,000 000	800,000 29,930,450 8,297,920	***************************************	75 39	76 39 ½	Western Union Telegraph Co †Div. guar. by Postal Teleg. Co.			97,870,000	1% %, Q, Jan. '99.	795/	7934
eElectric Traction Co	50	500,000	f192,500 [1,875,000	\$3 share Q. \$14 sha'e A—Apr. 59	845 450	451	Miscellaneous June 9: American Dist. Teleg. (Phila.)	25	400,000		1 % Q.	26	87
Lehigh Avenue Ry. Co	00		1.000.000	A. & O. \$9 share A, Mar. 98	90 800	901/9	Bell Teleph. Co. (of Canada.)	100 100	8,960,000	8,561,000	2 % 8.	188 61	66
dSecond & Third Streets Ry People's Traction Co gGermantown Passenger Ry	50 50	10,000,000	572,800	8 %, A., April, '98. \$5.25 share—1898.	150	151	Chicago Telephone Co	100 100	750,000	750,000	****	200 148 79	210 150 80
Green & Coales Passenger Rycom	25		150,000 740,000	3 % Jan., 1898.	151	152	Hudson River Telephone Co *Northwestern Telegraph Coguar	100 50	2,000,000 2,500,000	2,000,000 2,500,000	1 × Q. 25/4 × Q.	120	80 125 125
hPeople's Passenger Rypfd. (Philadelphia Traction Co (Oatherine & Bainbridge St	50	750,000 30,000,000	1400,000	\$2 p. sh., Oct. 98, 6 % A—Mar., '98.	98	961/4	Providence (R. I.) Teleph. Co	50 100	8,000,000		::::	941/	95
Continental Pass. Ry Co.	50	600,000	580,000	\$6 share—July, '98.	***	157	ELECTRIC LIGHT A	IN	DELE	EOTR	OAL MFG	. 0	os
Philadelphia City Pass. Ry. RR.	50	1,000,000	298 650	\$7.50 share July 98	100	2081/4	Boston, Mass.—June 9: Fort Wayne Electric trust receipts					115	125
Ridge Avenue Passenger Ry.	50 50	********	200,000 250,000	\$12 share, July '98. \$2 share July, '98. 1½ % S., July, '98. \$11 sh. A., July, '98.			Ft. Wayne Elec Co. T. Sec. Series A. General Electric Co. [old] com.	25 100			2 % Q., Aug., 1898. 1% % Q., Jan., 1900	86	48
Thirteenth & 10th Sts. Pass. 149	50	1,000,000 1,500,000	1900.000	My.bu anre, July so	200	240 268	General Electric Co. [new] " TH. Elec. CoT. Secur., Series D.	100			1½% Q., Jan., 1900	185	
West Philadelphia Pass. Rv Rochester, N. Y. – Jun e	50	750,000	1780,000	\$10 share, July '98	202	200	Westinghouse Elec, & Mfg.Co.com, Westinghouse El.& Mfg.Co. pfd, Westinghouse El.& Mfg.Co. assent.	50	4,000,000 11,000,000	146,700 8,996,058 8,195,126	1% % Q., Jan.,	61	62
Rochester Railway Co	100	5,000,000	5,000,000	*****	16	17	New YorkJune 9: Edison Elec. Ill'g Co., New York						
Reading, PaJune 9 Beading Traction Co		1,000,000	1,000,000	Semi-an.,Jan. & Jy	24 188	26	*Edison Elec. Ill'g Co., Brooklyn Edison Ore Milling Co	100 100 100	9,188,000 4,000,000	7,988,000	1½ % Oct., '98.	119	120
City Passenger Ry		1,000,000	\$50,000 \$1,000,000	Jan., '98. Jan., '98.	70	**	Electric Vehicle Oocom.   General Electric Co. [old]com.				2 % Q., Aug., 1898. 1½ % Q.,Jan., 1900.	82	92
St. Louis MoJune 9 Fourth Street & Arsenal Ry	50		150,000		0.0		General Electric Oo. [new] " Interior Conduit & Insulation Co Kings Co. El. L. & P. Co	100 100 100	1,000,000	18,276,000 1,000,000 2,500,000	****	185 41 110	1351/2
indell Ry	100		400,000 2,400,000	2 % Dec., 1888. 1¼ % Jan., '99. 1½ % Jan. '99.	::	::	Pittsburg, PaJune 9	100	2,500,000	2,000,000	A. & U.	110	120
Cass Avenue & Fair Croud	100	2,500,000	2,500,000 1,500,000	4 %, Oct., '98.	::	::	Lilegheny County Light Co East End Electric Light Co	100 50	500,000 800,000	500,000 800,000	J. & J.	168	172
St. Louis RR	100	2,400,000	2,000,000 2,800,000	4 %, Oct., '98. 2½ %, Jan., '99. 1½ % Jan., '99.			Philadelphia, Pa.—June 9 Edison Electric Light Co	100	2,000,000			144	14434
Jnited Electric Ry	50	500,000	500,000	50c., Dec., '89. 8 %, Jan., '99.	20½ 69	21 71	*Electric Storage Battery Coom. *Electric Storage Battery Copfd.	100 100	8,500,000 5,000,000			80	90
t. Louis & Suburban Ry Inion Depot RR		2,500,000	2 500 000	8 % A., July, '19	68	70	Northern Elec. Light & Power Co Southern Elec. Light & Power Co	10 10	550,000 187,500	550,000 187,500		18 80	185
San Francisco, Cal.—May.		1,000,000			117	119	MiscellaneousJune9 Bridgeport (Conn.) Elec. Lt. Co	25	500,000			47	48
teary Street Park & Ocean Mil.	100	1,000,000	875,000	50c. monthly. \$2.50 share, '96. Q., 60c. per share.	50 61½	681/4	Missouri-Edison (St. Louis)com. Eddy Electric Mfg. Co	25 100	******		:::	10	21 14
residio & Ferries R. L	100	1,000,000	550,000		••	16	Hartford (Conn.) Elec. Light Co Hartford (Conn.) Lt. & Power Co New Haven (Conn.) Elec. Lt. Co	25	850,000 175,000 100,000			150 6 195	185
Scranton Pa - June 9 Scranton Railway Co	50 100		2,500,000 500,000		29 16½	30	New Haven (Conn.) Elec. Lt. Co Narragansett (Prov., R.I.) Elec. Co. Bhode Island Elec. Protec. Co	50 100	1,200,000		2 % Q., Oct.,	98	
eranton Railway (or hondale Trac. Co. a Scranton & Pittston Traction Co. a Scranton & Pittston Traction Co. appringfield Ill.—June :	100		1,050,000		••	**	Royal Elec. Co. (Montreal)	100 100	1,000,000 1,085,000	1,085,000	1% Q 1% % Q 8 % 8, Dec. 1, 96.	201 181	202 182 <sup>8</sup> /4 100
pringfield Consolidated By	100	750,000	750,000	***************************************	***		Woonsocket (R. I.) Electric Co	100	the stock!			105	106
pringfield OJune 9 springfield Street Ry	100	1,000,000	1,000,000	**********		11	†On Aug. 17 last by a majority vot to \$20,827,200, of which \$18,276,000 is c   Recently acquired the Edison Illi	omn	on and \$2 asting Co.	,551,200 pr of Brook	eferred. yn and its constit	‡ Ex	div.
Ingingfield, MassJune 9.		1 000 000			207	010	pany, the Municipal Electric Light	Co.		10000			_
pringfield Street By Coronto Canada. – June 9.	100	1,200,000	1,166,700	8 % A.	201	212	Boston MassJune 9;	1	NOUS	JIKIE	0.		_
Coronto Street Ry  Lontreal Street Railway Co	100	6,000,000 4,000,000			100 260	100½ 261	American Electric Heating Co		10,000,000	1 248 700	2 p. sh. Jan. 26, '99	-	-
Washington, D. C June 9:		500,000	500,000				United Electric Securities Copid.	100	*****	1,000,000	8.50 p.sh. Nov'99.	-	100
Selt Ry. Co Sapital Traction Co Solumbia Ry. Co	100	112,000,000	12,000,000	65c. per sh, Oct. 19.	1043/4	105	New YorkJune 9:			1	10.11		-
Eckington & Soldiers' Home Ry Leorgetown & Tenallytown Ry	50	707,000 200,000	652,000 200,000		85 15	40 16	Consolidated Electric Storage Co Safety Car Heating & Lighting Co	100				8 150	12 155
Worcester, MassJune 9	50	1,000,000	458,900	2¼ % Q.	**		Worthington Pump Cocom. Worthington Pump Copfd	100 100	5,500,000	5,500,000			110
Worcester Traction Co6 % pfd	100	2,000,000	2,000,000	8 % S., Feb., '98.	81		Philadelphia PaJune9 Electro Pneumatic Trans. Co	10				97/	
Wercester & Suburban Street Ry Wilkesbarre, Pa.—June 9.	100	550,000	542,500	41/4 %, 1897.	•••	85	United Gas Improvement Coscrip. Welsbach Commercial Cocom.	10 50 100	1,500,000 10,000,000 8,500,000		==	27/8	162
Wilkesbarre & Wyoming Val. Trac.					25	29	Welsbach Light Copfd. Welsbach Light Co	100 5	500,000 525,100		×Q.	78 43	21 75 44 18/a
* Unlisted. † Paid in. ‡ Full a Leased to Hestonville, Man	& Fa	rmount Po	aggenger I	Ry for 6 % on atook	per a	nnum.	Welsbach Light Co., Canada Pittsburg, PaJune 9:	5	500,000			134	11/2
b Consolidation Electric, Pe charges and all indebtedness of Traction Company.	cons	ntuent an	d leased	companies assume	ed by	Union		100 100	200,000 1,000,000	200,000		190	192
c Practically all shares owned d Lease to Frankford & South	wark	Passenge	tion Com	pany. med by Electric T	ractio	n Co.	Miscellaneous Jun 9; *Barney & Smith Car Cocom.	100	*	1,000,000		141/4	10
f Controlled by Frankford & S	outh	wark Page	senger Ra	ilway.			*Barney & Smith Car Copfd. Billings & Spencer Co	100	******	2,500,000	3 %	104	107
a women and a cobio a respectific	wees.	my ms 40	Per Busie	anv.			Consol. Car Heating Co	100	1,250,000	1,250,000	1%% Feb	85	58 109
A Majority of stock owned by Leased to Union Traction Co	Peop mpa	ny.	ion Comp	,			Johns-Pratt Co	100	*******				
# Leased to People's Passenge A Majority of stock owned by 4 Leased to Union Traction Oo 5 Lease transferred to Union T # Leased to United Traction	racti Jomi	on Compa	ny.	\$10.000 per annum	n in 1	1866-7-8	*Pratt & Whitney Cocom. *Pratt & Whitney Copfd	100			==	40	50
d Lease transferred to Union T	omportally.	on Compa anyat a manum the	ny. rental of hereafter,	\$10,000 per annum payable semi-annum	n in lually,	1866-7-8 rental,	*Pratt & Whitney Cocom. *Pratt & Whitney Copfd	100				2 40 70 80	4

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# BONDS.

PASSEN	BER R	ALUIA					PASSENGER RAILWAY.						
	Amount.			Interest				Ame	unt.		T-tt		Г
NAME.	Authorized.	Issued.	Due	periods.	Bid.	Anked.	RAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Auto
Albany N. Y.							New Orleans La. Date of Quotation-June 9, 1900.					100	
Date of Quotation-June 9, 1900							Crescent City RR.	\$150,000	\$150,000 50,000	1912	M. & N. M. & N.	105%	
The Albany Ry. CoCons. mig. 5s. The Albany Ry. CoGen. mig. 5s. Watervleit Turnpike & RR.1st mig. 6s	\$500,000 \$50,000 \$50,000	427,500 875,000 850,000	1947	J. & J. M. & N. M. & N.	*117½ *117 *125	119%	New Orleans City RRCons. mtg. g. 5s.	5,000,000 416,500	899,000	1948	J. & J. J. & D.	108	iii
Watervielt Turnpike & RR. 181 mtg. 6s. Troy City Railway Co	150,000	150,000	1919 1942	M. & N.	*128 *116½	127%	tN. Orl's C'ty & Lake RR1st mtg. g. 5s. N. Orleans & Carrollton RR.2d mtg. g. 6s. Orleans Railroad OoOons. mtg. 6s.	5,000,000 850,000	2,599,500 850,000	1907	F. & A.	112	111
finterest guar, by Albany Ry. Co.	1		100	-	110/9		tst. Charles St. RR. CoIst. mtg. 6s.	800,000	800,000 75,000	1912 1906			
Principal and interest guar. by lbany By. Co.							leans City RR. Co.'s 1st mig. bonds. 1890,000 outstanding.			1			1
Baltimore Md.							New York. Date of Quotation—Ju ne 9, 1900.						1
Date of Quotation—June 9, 1900  'nited Electric Ry. Colst mtg. g. 4s	88,000,000	18,000,000		M. & S.	102	1021/4	Atlantic Ave. (Brooklyn)Imp. g. 5s.	1,500,000 759,000	1,500,000	1984	J. & J. M. & S.	95 10734	"ïi
Saltimore City Pass. By1st mtg. g. 5s.	14,000,000 2,000,000 1,500,000	2,000,000		M. & N.	748/4 1187/8	75	Bro'dway & 7th Ave letcong mtm Fa	8,000,000 12,500,000	1,966,000 7,650,000	1981 1948	A. & O. J. & D.	115	11
Baltimore Traction Co1st mtg. 5s. Baltimore Trac. Co. Exten. & Imp. g. 6s, Baltimore Trac. Co. Exten. & Imp. g. 6s,	1,250,000	1,250,000 1,750,000	1901	M. & N. M. & S.	119 1041/2 121	120	Broadway & 7th Ave	1,500,000 500,000	1,500,000 500,000	1914	J. & D. J. & J.	104	10
Bal, Trac. Co. No. Balto div. 1st mtg. g. 5s Bal, Trac. Co. Coll. Trust, 1st mtg. g. 5s. Baltimore Traction Co. Convertible 5s.	750,000 800,000	*********	1900 1906	J. & J.	101	12170	Broadway Surface 2d mtg. 5s.	1,125,000	1,125,000	1905		115	10
Dentral Pass. Ry. Co1st mtg. 6s. Dentral Pass. Ry. CoCons. mtg. g. 5s.	96,000 601,000	117,000 580,000	1912 1982	J. & J. M. & N.	119	121	Brooklyn City & Newtown 1st mtg. 5s. Brooklyn City & Newtown 1st mtg. 5s. Brooklyn, Bath & W. E. RR. Gen. mtg. 5s.	5,000,000 2,000,000 1,000,000	6,000,000 2,000,000 448,000	1989	J. & J.	116 115 101	11
Nity & Suburban Rylst mtg. g 5a. Lake Roland Elev.,lst mtg. 5s.	8,000,000 1,000,000	8,000,000 1,000,000	1922	J. & D.	116	117	Brooklyn O's Co & Sub's let mtg. 5s.	250,000 8,500,000	250,000 8,500,000	1941	A. & O.	104 112	
All of the bonds of the above ompanies, marked t, have been as-							Brooklyn Ranid Transit	4,500.000 7,000.000	2,750,000 5,181,000	1945	M. & N.	107	***
umed by the United Railways & Elec-							Cent P'k N & E R RP 1st cons	1,200,000	700,000 1,200,000	1900 1902	J. & D.	107	10
Boston, Mass.							Coney Island & Procedure 181 mtg. 68.	250,000 800,000 1,000,000	250,000 800,000 980,000	1908	M. & N. J. & J. J. & D.	125 101 117	10
Date of Quotation—June 9, 1900. Lynn & Boston RRlst mtg. g. bs.	5,879,000	8,702,000	1924	J. & D.	114	115	2D Dock, E. Bd'y & Bat'y R. gen.mtg. 58 Dry Dock, E. Bd'y & Bat'y R. gen.mtg. 5.8 Dry Dock, E. Bd'y & Bat'y RR. serip 5 %. Eighth Av. RR. Co Oert. Indebt. 6 %. 42d St., Man & St. Nich Av. Let with 6.6	. 100,000	1,100,000	1914	F. & A.	102	10
Vest End Street RyDeben. g. 5s. Vest End Street RyDeben. g. 4\( \)s. +\$1,674,000 in escrow to retire outstand-	8,000,000 2,000,000	8,000,000 2,000,000	1914	M.& N. M. & S.	104%	106	42d St., Man & St N Av 2d mtg ing ca	1,500,000	1,200.000 1,500,000	1915	J. & J.	116%	11
bonds of absorbed companies.							Lex. Ave. & Pav. Ferry RR. 1st mtg. g.5s. Metropolitan St Ry Cog. m. cl. tr. g.5s. Second Avenue Ry. Gen. cons. mtg. 5s.	5,000,000 12,500,000 1,600,000	19,500,000	1998 1997		124 120 130	12
Charleston S. C.  Bate of Quotation—June 9, 1900.							Steinway Ry (T. T.) 1-2	800,000 1,500,000	800,000	1909	J. & J. J. & J.	118%	10
Enterprise Street RR1st mtg. 5s.	500,000	47,000		J. & J.	106		Third Avenue RR. let mtg. 58.	850,000 5,000,000	850,000	1919 1987	J. & J.	110%	11
harleston City Ry	850,000	••••		J. & J.	100	****	Twenty-third Street Ry 1st mtg. 6s.	150,000	150,000	1909 1906	J. & J.	106	10
Chicago III.							Union (Huckleberry) Rylst mtg. 5s. ## Westchester Electric RRlst mtg. 5s. ##1,085,000 in escrow to retire gen. mtg.	2,000,000 500,000	2,000,000 500,000		F. & A J. & J.	118 110	11
Date of Quotation—June 9, 1900.  Thicago City Bylst mtg. 41/48.	6,000,000	4,619,500	1901	J. & J.	1013/4	21/4	1\$4,850,000 in escrow to retire maturing						
Ohicago Passenger Rylst mtg. 6s. Ohicago Passenger RyCons. mtg. 6s.	1,000,000 7,500,000	600,000	1929	F. & A. J. & D.		102	18552,000 in escrow to retire 1st and 2d						
Ohicago & So. Side R. Tlst mtg. g. 5s. hicago & So. Side R. T	1,500,000	7,500,000 750,000 4,040,000	1907	J. & J.	1081/2	100	%In treasury, \$80,000.						
ake Street Elevated RRlst mtg. g. 5s. etrop. W. Side Elev. Rylst mtg. g. 5s.	7,574,000 15,000,000	8,781,200 15,000,000	1928	J. & J.	96	96%	tt Guar. by Union By. Co. Toronto Canada.						
orth Chicago St. RR1st mtg. 5s. orth Chicago St. RR Cert. indeb. 6s.	8,171,000 500,000	8,171,000	1906	J. & J.	106		Date of Quotation-Jun , 1900. Montreal St. Rylst mtg. 5s.	2,500,000	900 000	1908	M. & S.		
orth Chicago City Rylst mtg. 6s. orth Chicago City Ryconsol. 41/2s.	500,000 2,500,000	2,500,000	1900 1927	J. & J. M. & N.	108		1385,000 per m. single track authorized	4,550,000	2,200,000	1921	M & S.	••••	***
Test Chicago St. RR1st mtg. 5s. Test Chicago St. RRDeben. 6s Test Chicago St. RRCon. mtg. g. 5s.	4,100,000 2,700,000 12,500,000	8,969,000 700,000 6,000,000	1911	J. & D.	101	102	3000,000 in escrow to retire 6s due in 1901.	-					
W. Ohicago St. RR. Tunnel1st mtg. 5s. †Redeemable at option on 60 da. notice.	1,500,000	1,500,000	1909	F 24 A.	1068/8	107	Philadelphia.  Date of Quotation—June 9, 1900						
Funded debt assumed by Chicago W. iv. Ry. Co., controlling interest of hich is owned by W. Chicago St. RR.							Continental Pass. By	850,000 800,000	810,000 200,000	1909 1900	J. & J. J. & J.	****	***
o., lessee.							Lombard & So. St. Page Py 1st mtg. 68	100,000 150,000	100,000	1901	J. & J.	::::	•••
Subject to call after Oct. 1, 1899, at 10 and interest. [Assumed by W. Chi. RR. Co., lessee.							People's Pass. By	250,000 500,000	250,000 458,000	1911	J. & J.	::::	***
Int. guar. by W. Chicago St. RR. Co.							People's Pass. Ry	1,125,000 5,698,210 200,000	867,000	1912 1948 1910	M. & S.	::::	:::
Cincinnati, O.  Date of Quotation—June 9, 1900.			Ì				Phila. City Passenger Bylst mtg. 5s. Philadelphia Trac. CoOoll. tr. g. 4s. Thirteenth & 15th St. Bylst mtg. 7s.	1,800,000 100,000		1917 1908	F. & A. & O		***
New & Cov.St. By. 1st Con. mtg. g. 5	8,000,000	2,500,000	1922	J. & J.	114%	115	Union Passenger Bylst mtg. 5s.	500,000 29,785,000	500,000 29,724,876	1911 1945	A. & O. A. & O.		***
14. Adams & Eden P'k Inlst mtg. 68 14. Adams & Eden P'k Inlst mtg. 68 14. Adams & Eden P'k Inc. Cons. mtg. 50	46,000 100,000 581,090	100,000	1905	A. & O. A. & O. M. & S.	108½ 114 108¾	104	West End Passenger Ry 'string. 7s. West Phila. Pass. Ryls tg. g. 6s. West. Phila. Pass. Ry	250,000	246 000	1905 1906	A. & O.	:	***
o. Oov. & Oin. St. Rylst mtg. 6s lo. Oov. & Oin. St. Ry2d mtg. 6s	250,000 400,000	250,000 400,000	1912	M. & S.	12i % 182¾	122½ 187	The trust certificates were issued to pay for the shares of the Electric and	750,000	750,000	1920	M. & N.	*****	****
† Assumed by the Oincin. St. Ry. Co. [\$250,000 reserved to retire 1st mtg. bds		200,000	1002				People's Traction lines purchased.						
Cleveland O.							Pittsburg. Pa.  Date of Quotation - June 9 1900						
Date of Quotation - June 9, 1900. Brooklyn Street RR. Co1st mtg. 68.	600,000	600,000	1000	M. & S.	1061/2	107	Birmingham, Knox & Allentown68.	500,000 875,000		1981	M. & S. J. &. J	1111/4	
n. New't & Cov. St. Ry. Cons. mtg. 58. eveland City Cable Ry lst. mtg. 58	8,000,000 2,000,000	2,500,000 2,000,000	1922	J. & J.	1181/4	1145	*Duquesne Traction Co	1,250,000 1,500,000	875,000 1,250,000 1,500,000	1980	A. & O. J. & J.		****
Neveland Electric Ry.Co. 1st mtg. g. 5s blumbus (O.) Cent. Ry1st mtg. g. 5s last Cleveland RR1st mtg. 5s.	8,500,000 1,500,000	1,249,000	1918	M. & S. M. & N.	106	107	Fed'l St & Pleasant Valley Com	50,000 1,250,000	50,000	1918	J. & J. J. & J.		
Wayne (Ind.) Elec. Ry.1st mtg. g. 6s. orain (O.) Street Ry1st mtg. 6s.	1,000,000 600,000 200,000	1,000,000	1910 1922	M. & N.		107½	Pittsburg, Crafton & Manafield	750,000 250,000	750,000 250,000	1928	M. & N. J. & J.	110	11
1. Ry. Oo., Grand Rapids 1st mtg. 5s. \$1,900,000 in escrow to retire bonds of	600,000	200,000 600,000	1915 1912	J. & D.		::::	Pittsburg Traction Co	750,000 1,500,000 500,000	1,500,000	1929	A. & O. M. & N.	112	113
sorbed companies, marked a. Interest guar. by Cons. St. Ry. Co.	*						Second Ave. Traction Co.	500,000 1,500,000 2,500.000	1,400,000	1980 1984	A. & O. J. & D.		010 0-0
Detroit, Mich.  Date of Quotation—June 9, 1900.							Sub. Espid Transii Railway Co68.	500,000	500,000	1918	Y. & 8.	*****	***
etroit Citizens' St. Rylst mig. 5s. Wayne & Belle Isle Rylst mig. 6s.	7,000,000	8,885,000				1021/4	Providence R. I.  Date of Quotation - June 9, 1500.						
te Detroit Rylst mtg. 5s. \$1,150,000 in escrow to retire bonds of	1,800,000	877,000 1,800,000		A. & O. J.&D.	105	1061/2	Newport Street RyCoupon 5s	50,000	50.000	1910	J. & D.		
New Haven Conn.							United Trac. & Elec. Colst mtg. g. 5e	9,000,000	8,260,000	1988	M. & S.	116	11
Date of Quotation-June 9. 1900.							St. Louis.  Date of Quotation-June 9, 1900.						
ew Haven St. Rylst mtg. g. 5s. ew Haven (Edgewood Div.) lst. mtg. 5s.	600,000 250,000	600,000 250,000	1914	J&D	111 111		Baden & St. Louis RRIst mtg. 5s.	250.000 1.813.000	250,000	1918	J&J	101%	100
inchester Avenue RR—lst mtg. g. 5s.	100,000	\$00,000		M&N	109	******	Citizens' Bailway Colst mtg. 5s.	2,000,000	1,813,000 1,500,000	1000	J&J J&J	101%	10

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PASSEN	PASSENGER RAILWAY.													
WAND	Ame			Interest	Bid.	Asked.								
WARE.	Authorised.	Issued.	Due	periods.	Die	ABLOW								
St. LOUIS.  Date of Quotation—June 9, 1900.					ŀ									
Jefferson Avenue Bylst mtg. 5a. Lindell By. Colst mtg. 5s	400,000 1,500,000	400,000 1,500.000		M. & N. F. & A.	108 108	105 109								
Missouri RB. Co	1,000,000 400,000	700,000 800,000	1916 1910	M. & S. A. & O.	105 100	106 102								
People's RB. Co	125,000 75,000	125,000 75.000	1902 1902	M. & N.		•••••								
People's RR. Co	1,000,000 75,000 2,000,000	800,300 75,000 2,000,000	1904 1905 1900	J. & J.	100	101 100×								
81. Louis & Sub. ByIncome 5s.	2,000,000 800,000	1,400,000 800,000	1921	F. & A.	108 80	104 84								
††Southern Electric ByCons. mtg. 6s. †Taylor Avenue St. Bylst mtg. g. 6s.	500,000 500,000 1,091,000	500,000 500,000	1909 1918 1900	J. & J.	106 116 100	108 118 100%								
Union Depot BB. Colst cons. mtg. 6s. Union Depot BB. CoCons. mtg. 6s.	8,500,000	1,091,000			121	122								
†Controlled by St. Louis RB. Co. †Controlled by Union Depot RB. Co. †Controlled by Lindell RB. Co.		l												
\$200,000 in escrow to retire this as no														
mtg. 2500,000 in escrow. 15200,000 in escrow to retire 1st mtg.														
San Francisco Cal.  Date of Quotation—May, 1900.														
California St. Cable BB	1,000,000 650,000	900,000 650,000	1915 1914	J. & J. M. & S.	114	117 117								
Geary St., Park & Ocean BBist. mtg. 5s. Market St. Cable By. Colst mtg. g. 6s.	1,000,000 8,000,000	671,000	1921 1918	A. & O. J. & J.	1263	96								
Metropolitan By. Co	200,000 2,000,000 850,000		1918 1912	A. & O.	126%	109								
Park & Cliff House BRlst mtg. 6s. Park & Ocean BRlst mtg. 6s. Powell St. Rylst mtg. 6s.	850,000 250,000 700,000		1912 1914 1912	J. & J. J. & J. M. & S.	105 % 115	107  125								
Sutter St. By. Co	1,000,000	900,000	1918	M. & N.	•	•••••								
Washington D. C.  Date of Quotation – June 9, 1900														
Belt By. CoOons mtg fe.	500,000 500,000		1914	J. & J. A. & O.	182	••••								
Eckington & Soldiers' Home. " mig. 6s. Metropolitan BB. CoColl. tr. cons. 6s.	200,000 500,000	200,000 500,000	1911 1 <b>90</b> 1	J. & D. J. & J.		•••••								
†#50,000 in escrow to retire 1st mtg.bds. Miscellaneous.														
Bridgeport Traction Colst mig. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110								
Buffalo (N. Y.) By. CoCons. mtg. 5s. †( 'tisens' St. B. (Ind'polis).lst cons.m.5s !Crosstown St. By. (Buffalo).lst. mtg.5s.	5,000,000 4,000,000	8,543,000 8,000,000	1938	F. & A. M. & N.	118 104	104								
Columbus (O.) St. Bylst cons. g. 5s. Consolidated Traction (N. J.)lst mtg.5s	8,000,000 8,000,000 15,000,000	2,366,000 2,261,000 18,965,000	1932	M. & N. J. & J. J. & D.	112	118								
Crosst'n St. Ry. (Colu's, O.)lst mtg.g.5s Denver City Cable Rylst mtg. g. 6s.	2,000,000 4,000,000	572,000 8,800,000	1938 1920	J. & D. J. & J.	111 <sup>1</sup> / <sub>4</sub> 115 20	115%								
Denver Con. Tram'y CoCon. m. g. 5s. Louisville (Ky.) Bylst cons. mtg. g.5s. Minneapolis St. Bylst cons. mtg. g. 5s	4,000,000 6,000,000	922,000 4,981,000 4,050,000	1980	A. & O. J. & J.	80 119	85 11914								
†No. Hudson Co. Ry. (N. J.). Cons. mtg. 5s No. Hudson Co. Ry. (N. J.)2d mtg. 5s. No. Hudson Co. Ry. (N. J.)Deb. 6s.	5,000,000 8,000,000 550,000	2,878,000 550,000	1928 1928	J. & J. J. & J. M. & N.	110¼ 108	110%								
No. Hudson Co. Ry. (N. J.)Deb. 6s. Paterson (N. J.) ByCons. mtg. g. 6s. Bochester (N. Y.) Bylst mtg. 5s.	500,000 1,250,000	489,000 1,000,000	1902 1981	F. & A. J. & D.										
St. Paul City Ry	8,000,000 5,500,000 1,000,000	2,000,000 4,298,000 1,000,000	1987	A. & O.	10514	106								
†\$1,000,000 in escrow to retire 1st and	2,000,000	1,000,000		•••••	108	••••								
d mig. bds. \$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.					i									
18760,000 in escrow to retire bonds of O. St. BR. Co.			ŀ											
\$87,000 in treasury. \$960,000 res'ved to redeem prior liens. \$2620,000 in escrow.														
					*Wish i									
ELEOTRIO LIGHT AND	) ELE	OTRIC	AL	. MF	<b>3.</b> O	os,								
Boston, Mass.  Date of Quotation—June 9 1500						103								
Delaware Gas Lt. Co.,lst m. 5s, g. Edison Elec. Illuminating Co., Boston General Electric Cogold coup, deb. 5s	800,000 2,026,000 10,000,000	8,750,000	1922	J. & J. Quar.	106 157 116	103								
Pittsburg Pa	,,	5,,00,000												
Date of Quotation—June 9, 1900 Allegheny County Light Co	500,000 195,570			J. & J. M. & S.	110	•••••								
Westinghouse Elec. & Mig. Co. Scrip 6s. Miscellaneous.—(June 9, 1900.)	195,570	*****	•••••	.u. o. o.	••••	*****								
E lison El. Illg. Co. (N. York) 1st m. 5s E lison El. Illg. Co. (N. Y.) con. m. g. 5s.	4,812,000 15,000,000	2,188,000	1910 1993	•••••	109 124	*****								
E lison Elect. Illg. Oo. (Brooklyn) E lison Electric Light (Philadelphia) Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	5,000,000 2,000,000 2,500,000	35	1940	A. & O.	1221/	124								
Kings Co. El. Lt. & Po. Co. pur. money 6s. Milwaukee El. Ry & Lt. Co. lst con. g. 5s.	5,176,000 8,000,000	3 (	1997	A & O. F. & A.	120 102)	122								
TELEPHONE	5,000,000   AND 1	TELEG	····  RA	PH.	• 1	••••								
Miscellaneous.			1	1	1									
American Bell Telephone			1908	F. & A.	1001/4	101								
Northwestern Telegraph Co	••••••		1911	J. & D.	1'4	315 106								
ALLIED	INDUS		<u>-</u> -	1										
Miscellaneous.			- <del></del>		ı	!								
Date of Quotation—June 9, 1100 American Electric Heating7s.	500,000	<b>5</b> 90.000		*******	••••	*****								
Armington & Sime Engine Co		********	1942	J. & J	106	25 107								
Carborundum Mfg Co	75,000		1904	J & D. ⊶······	115	127								
Unlisted 'Nominal	•													

# NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 162@162c.; Lake, 162@162c.; casting, 162@162c.

Directors of the Commercial Cable Company have declared the regular quarterly dividend of  $1\frac{3}{4}$  per cent.

The first session of the Fifty sixth Congress ended at 5 o'clock on the afternoon of June 7. Congress will not meet again until December 3.

A director of the Union Traction Company of Philadelphia states that a conservative estimate indicates a year's surplus of \$1,000,000.

The Boston "News Bureau" states that the United Verde Copper Company is to day paying a dividend of 75 cents a share. This is an increase of 25 cents a share in the semi-monthly rate.

It is stated at the Calumet & Hecla office in Boston that the temperature at No. 2 shaft is down to about 76 degrees. It is believed that the fire is out. The shaft will probably be opened this week.

The latest quotations for some of the new industrial stocks, not given elsewhere are: Electric Boat, 18 3/20; New York Electric Vehicle Transportation, 8@8}, New England Transportation, 4@4½; Gramophone, 35@46.

The statement of the Metropolitan Street Railway Company of New York for the quarter ending March 31 showed gross earnings of \$3 268,260, an increase of \$418 356; net, \$1.715 824, an increase of \$313,557, and surplus after charges, \$729,398, an increase of \$221 847.

A certificate of reduction of the capital stock of the Postal Telegraph-Cable Company from \$1.000,000 to \$1.00.000 was filed with the Secretary of State at Albany last week. The amount of capital stock paid in is \$1,000,000. The debts and liabilities are less than \$5,000.

Wilson & Stephens of New York City offer to investors, at 102½ and accrued interest, 1.25 1,000 5 per cent. collateral trust gold bonds of the Eric Telegraph & Telephone Company, due January 1, 1929, interest payable January 1 and July 1. These bonds are part of \$2,000,000, \$750,000 having already been sold.

The Outario Light & Traction Company, the purchaser of the property and franchise of the Canandaigua (N. Y.) Electric Light & Railroad Company has been incorporated at Albany, N. Y., with a capital of \$100,000. Directors are J. Howard Burgess and Hubert C. Mandeville of Elmira and J. N. Purdee of Canandaigus.

The Brazil Electric Street Railway Company has been sold to John G. Bryson and J. N. Halsted, of Brazil, and Frank Edwards, of Indianapolis, Ind., for \$33,-750. The purchasers are agents for S one and Webster, the Boston men who are constructing the interurban line from Terre Haute, Ind., to Brazil, and who also own the street railway and electric lighting systems in that city.

The announcement is made that the A. M. Young syndicate of New York City, which has been actively engaged the past two months in acquiring New England roads, has acquired another trolley line in the Enfield & Longmeadow Railroad. The road is ten miles in length, and its capital stock is \$116,000, with a bonded debt of \$100,000 drawing 5 per cent. and payable in 16 years.

The stockholders of the Hartford Light & Power Company met recently and voted to dissolve. The directors of the company will make an application to the superior court under the vote of the stockholders to have the corporation discolved. The capital stock of the company was \$225,000, divided into 9,000 shares. All but a small portion of the stock is owned by the Hartford Electric Light Company, the stockholders have sold it at different times for \$10 a share.

A statement prepared by the Chairman of the Senate and House Appropriation Committees and submitted to Congress shows that the total appropriations made at the joint session of the Fifty-Sixth Congress amount to \$7.9,729,476, including \$131.247,155, estimated, to be on account of or incident to the late war with Spain. Deducting this sum, the total shows an increase over the year 1898, which immediately preceded the Spanish war, of \$49,747,242.

Capital stock of the Doylestown & Willow Grove Railway Company, operating in Pannsylvania has been increased, in compliance with requirements of the statute, from \$100,000 to \$500,000, and a mortgage has been executed to the Land Title & Trust Company of Philadelphia, trustee, for \$500,000 to secure an equal amount of first mortgage 4 per cent. gold bonds maturing 1933, in denomination of \$1,000 each, coupons payable semi-annually.

The Portland Trust Company of Portland, Me., has taken up the mortgage on the Portland and Saco electric road. The bonds were issued for refunding purposes and it is understood that the company is now controlled by the same officials who control the Portland Street Railway Company. It is thought that in a short time or as soon as the objections of the railroad commissioners can be overcome, the Portland Street Railway Company will extend its line to Saco and Biddeford.

The Grand Rapids Railway Company will extend its line to Saco and Biddeford.

The Grand Rapids Railway Company has acquired and now owns and operates all the street railway lines of Grand Rapids, Michigan, consisting of over 50 miles of single electric track. Its gross earnings for the year ended April 30, 1990, were \$486 161 as compared with \$42,332 for the previous year, and \$374 691 for the year before that. The net earnings for the year ended April 30, 1990, were \$215,208. The company has recently been authorized to issue \$3,500,000 5 per cent. bonds, and has issued \$2,500,000, dating them June 1, 1900, payable in 16 years.

A Philidalphia capitalist layed interested in the Floating Company of America.

A Phils delphia capitalist, largely interested in the Electric Company of America, says: "The company's position by the sale of its Long Island plants has been strengthened considerably. The sum received for the plants was two or three hundred thousand dollars in excess of the cost, and this profit which, added to the balance on hand to the credit of the profit and loss account, gives something like \$1,000,000 applicable to dividends. This amount would enable the company to continue the semi-annual dividend payments of 50 cents a share, or \$4°4,000 a year, for several years to come, even if the earnings fell scant of the required figure. In addition to this, the money received for the Long Island properties, will undoubtedly be reinvested in a way to increase the income."

The thirty-six properties of the Massachusetts Electric Companies with a total mileage of 759 miles have now been combined into fourteen companies and this number will probably later be reduced to seven or eight companies. The fourteen companies are: The Lynn & Boston Railway Company, Brockton Street Railway Company, West Roxbury & Roslindale Railway Company, Globe Street Railway Company, Newport & Fall River Company, North Woburn Street Railway Company, Taunton Street Railway, Hyde Park Electric Company, Quincy & Boston, Nashua Street Railway, Lowell, Lawrence & Haverhill, Lowell & Suburban, New Bedford, Middleboro & Brockton, South Shore & Boston.

A New York syndicate has purchased the La Salle, Ill., gas and electric light plant. The men who compose the syndicate are C. W. Morse, John F Carroll, Richard Croker, Robert A. Van Wyck, and others. The bulk of the stock of the concern has for several years been owned by New York parties. N. R. Wilson of New York negotiated \$104.000 worth of bonds, and is the concern's agent in the East. The Croker syndicate has secured to date the gas plants of Decatur. Kewanee, Galesburg, Peru, La Salle, Champaign, Urbana, and Peoria. Negotiations are in progress for others, and all are to be incorporated under one name, with a large capital stock.



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# PLECTRICITY

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# EDITORIAL NOTES.

The Cleveland Independent Telephone Convention.

For the fourth time in the history of the country the representatives of the various independent telephone interests of the United States were gathered togeth-

er to discuss the several phases of the independent telephone movement, and it is no exaggeration to say that the Cleveland Convention, which has drawn to a close, has done much in the way of cementing the independent interests in their fight against the common enemy, the Bell monopoly.

In spite of the fact that the independent telephone movement is, comparatively speaking, in its infancy, it has already accomplished wonders in the way of erecting lines and furnishing service at reasonable rates. According to Judge Thomas, who has examined carefully into the matter, there are at the present time, no less than 3,000 independent companies operating in all parts of the country. These companies have in actual service in the neighborhood of 1,000,000 telephone instruments, demand for which has been created within six years, at which time the independent telephone movement first saw the light of day. The Bell Telephone Company was, on the other hand, nearly twenty years in creating a demand for 582,506 telephones. The reason for this is clearly set forth in a paper read at the convention by Mr. E. L. Barber, in which among other things he said:

"At the time of the advent of the independent movement had those who were in possession of the telephone interests of this country been disposed to be half way fair with the people the independent telephone movement would never have been born, and those of us who are here assembled to-day would never have had the pleasure of communing with each other, nor the experiences we have had since we engaged in this line of human endeavor. But they were not so disposed. They seemed to believe that they had everything their own way; that the telephone was invented only for the rich of the populous centers of our country, and by their acts of exclusion deprived nine-tenths of the population of our country the privilege of enjoying this greatest of modern improvements. The telephone is no longer a luxury to be enjoyed by the rich, but it has become an everyday necessity to the home, as the cook stove, and essential to the business office as the desk or typewriting machine."

Thus the success so far of the independent companies may be attributed to the fact that they are willing to furnish service at reasonable rates, or in other words, at a price that the man of moderate means can afford to pay. In short they prefer a small profit from the many rather than a large profit from the few. And this is as it should be, as such a policy cannot help but stimulate the demand which, while benefiting the producers or telephone companies, also redounds to the well being of individuals and communities by placing within their reach a device that has grown to be an everyday necessity.

In the struggle which is now waging between the independent telephone companies and the Bell monopoly one thing alone is to be feared, which would result in the death of the independent movement, and which was dealt with most ably in the paper read by the Hon. C. W. Kline. He said: "Let us pool our issues, wipe out our disagreements, stand heart to heart, shoulder to shoulder in an onward and upward march to telephonic perfection. Let the spirit of our sires fully imbue us with that old truth 'United we stand, divided we fall.'"

This advice is well worth heeding, and is the keynote to success.

St. Louis Strikers to Boycotting.

Negotiations to settle the big railway strike in St. Defeated Resort Louis have been started by the strikers. The bold stand taken by the citi-

zens and the Transit Company has forced the strikers to plead for reinstatement.

After weeks of internecine strife, where a body of men led by brainless leaders attempted to destroy the welfare of a large city, and did cause the loss to its citizens of millions of dollars and an untold amount of suffering and humiliation, we are informed by a dispatch from St. Louis that a proposition has been made to the Transit Company for "peace"that is, the mob element has been persuaded to stop chasing women and children through the streets and denuding them of their clothing, besides committing other shameless indignities, to quit firing shots at passing cars and maltreating the citizens generally-if the Transit Company will consider the following

proposition made by the strikers' executive committee:

"That no discrimination will be made against any employe because he is or may become a member of any union; that the company will treat with any committee representing the organization regarding any matter of mutual interest; that the company will agree that if any future differences shall arise between it and its employes with respect to the terms of agreement or its application to cases that shall hereafter arise which cannot be adjusted amicably between the parties, they shall be submitted to arbitration; that the question of the reinstatement of former employes shall be submitted to arbitration."

Of course the Transit Company will give the matter due consideration, but being "masters of the situation" it is doubtful if they will allow the strikers to dictate an agreement now that they have sufficient non-union men to run the cars. It is claimed that Mr. Samuel Gompers, president of the Federation of Labor, induced the hot-headed leaders to make the above proposition in order to draw out a reply from the Transit Company, and secure situations for some of the strikers.

Of course in all strikes like that at St. Louis the population generally side with the employes against the railroad company, but when professional rowdies take part in the contest and bombard cars with stones and other missiles, then the strikers lose the sympathy of the public, and they soon become convinced that they cannot oppose the majesty of the law.

If Mayor Ziegenhein of St. Louis had exercised his good offices as peacemaker when the trouble started, there is no doubt but a settlement could have been effected. Instead, however, he acted an ignoble part throughout, and to his vacillation is partly due the serious trouble that has been caused by the lawless element.

In New York and Brooklyn strikes of the same nature as that now existing at St. Louis were suppressed when violence was resorted to or men prevented from working who were anxious for employment, and considering the assaults constantly being made upon men usually not belonging to a trade or labor organization, like those now running the electric cars in St. Louis, it would seem opportune to recall a truth set forth by Justice Bradley of the United States Supreme Court in the famous slaughter-house cases. He first called attention to the fact that the Declaration of Independence lays the foundation of our national existence upon this proposition: "That all men are created equal; that they are endowed by their Creator with certain inalienable rights; that among these rights are life, liberty, and the pursuit of happiness." But these rights "are equivalent to the rights of life, liberty, and property." Justice Bradley then went on to say: "These are fundamental rights which can only be taken away by due process of law, and which can only be interfered with, or the enjoyment of which can only be modified, by lawful regulations necessary or proper for the mutual good of all: and these rights, I contend, belong to the citizens of every free government. For the preservation, exercise and enjoyment of these rights, the individual citizen, as a necessity, must be let free to adopt such calling, profession or trade as may seem to him most conducive to that end. Without this right he cannot be a free man. The right to choose one's calling is an essential part of that

liberty which it is the object of government to protect; and a calling, when chosen, is a man's property and right. Liberty and property are not protected when these rights are arbitrarily assailed." When, therefore, laborers or workingmen not belonging to any industrial organization are boycotted and forbidden to get their living in any honorable way that seems best to them, then we have a violation of what Justice Bradley most properly called "the foundation of our national existence."

Since the above was put in type a dispatch from St. Louis says that the Transit Company has refused to comply with the strikers' proposition and the latter have declared a boycott on the company's lines—the "old gag" before seeking another job.

\* \* \*

# Electricity for the Elevated Roads.

Some two or three years ago it was announced with a great blare of trumpets and the use of a large amount of printer's ink that the an-

tiquated equipment of the Manhattan Elevated Railway in this city was to be replaced by an electrical method of train propulsion. This announcement, although not positively contradicted by the officials of the company, was, as it turned out, premature, for although several years have gone by, the patient and resigned citizens of Manhattan Borough are still being drawn to and from their places of business by oil-dripping and smoky locomotives, which precludes dwellers along the lines from opening their windows in summer for fear of being asphyxiated.

Probably in no other city of the world would the unsanitary and unsatisfactory conditions that have maintained on the elevated roads of this metropolis have been allowed to exist so long. Fortunately, as the old saying goes, "It is a long road that has no turning," and the bend is now apparently in sight, for at a meeting of the executive committee of the Manhattan Elevated Railway Company last week resolutions were passed that would seem to augur the early carrying out of the plan which has been dangled before the New York public for the past two years.

First, the committee approved contracts for the machinery of the new power house at Seventy-fourth street and the East River. This comprises eight 8,000 horse-power engines, the necessary boilers and electrical generators and apparatus. The machinery will begin to arrive the first part of next October, when the power house will be about completed. The central station apparatus involves, so it is claimed, an expenditure of about \$3,000,000. Referring to the progress made in the construction of the central station Mr. George J. Gould is reported as saying:

"The excavation of the power house site in solid rock is completed, and the concrete foundations for the building are well under way. The structural steel for the building itself, which is 200 feet by 425 feet, will arrive on the ground and its erection commence not later than July 1. In fact, there only remains the exterior walls to be contracted for, which will be done at our next meeting, so that that work can commence on July 1, concurrently with the erection of the iron work."

At this same meeting the final report of the company's experts on the question of car equipment was also considered. After going over the matter, the committee directed the adoption of what is known as the double-end

system, i.e., a motor car on each end of a train, equipped with four motors each. These motors will be of about 100 horse-power, or 800 horse-power to a train, which is about four times the power of one of the locomotives now in use. During the day, trains will consist of six cars, while at night, one, two, or as few cars as desired may be run. The cars will have wider doors and platforms than those in use and will be lighted by incandescent lamps, which will certainly be a great improvement over the dim, ill-smelling oil lamps now doing service.

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Another proposition acted on by the committee at its meeting was the placing of electric elevating stairways at some of its stations. Contracts were approved for the erection of such stairways at Fifty-ninth street and Third avenue, and Twenty-third street and Sixth avenue. Different types of elevating stairs will be tried, and whichever seems most desirable will be made use of at other stations.

The work of changing the motive power will begin on the Second Avenue road first, as this line is nearest the new central power station. The work, according to Mr. W. E. Baker, the chief engineer, cannot proceed very rapidly, as the laying of the third rails, etc., will have to be accomplished without interrupting traffic. Nevertheless it is claimed that electric trains should be running on this line by February, 1901, which means that lines on the west side of town, such as the Sixth avenue, and Ninth avenue, will probably not be equipped electrically until well on toward 1902.

# UNDER THE SEARCHLIGHT.

### Notes and Comments on Various Topics.

THE Union Safe Deposit & Trust Company of Portland, Me., recently contracted with the Bankers' Electric Protective Company of New England for the new electric protective system for its vaults. The system will be installed immediately.

THE "Pall Mall Gazette" of London says that the difficulty of sending messages by wireless telegraphy which shall not be legible by the whole world seems to have been solved by a most ingenious device presented by M. Tommasi to the Academie des Sciences at their meeting of last week. He uses at the sending station not one, but two transmitters. One of these transmits the real dispatch by the usual code, while the other sends only a series of meaningless dots and dashes produced by a mechanical process. The range of this last transmitter is kept always rather less than the other, so that at the receiving stations only the code signals will be received. If, however, an attempt be made to intercept the signals by means of a receiver interposed between the sending and receiving stations, both the real message and the meaningless clicks will appear together, with the result that the message will be utterly unintelligible.

Probably there is no class of men better prepared to withstand a sudden shock or a genuine surprise than the legal gentlemen employed by the electric railroad companies in Greater New York, accustomed as they are to listening daily to "hard luck" stories of accidents and "hairbreadth escapes from the deadly trolley car," but they must have been jarred when they learned that a New York man has made application to the Supreme Court to have set aside a verdict for \$3,349.50 secured by him



two years ago against the Third Avenue Railroad Company for injuries received in a collision. He says he is not entitled to the money, and that, moreover, he is about to die.

An electrical plant will be operated in connection with the Oconee cotton mills, at Seneca, S. C.

THE June 16 issue of the "Railway and Engineering Review" of Chicago, gotten out on the occasion of the Master Mechanics and Master Car Builders' Convention at Saratoga, deserves special mention. It is replete with handsome photographs of mechanical officials, and will undoubtedly be kept and frequently referred to in the years to come. This special issue in its way is a work of art, and should be in the hands of all persons interested in mechanical enterprises.

THE Saginaw Southern Electric Railroad, which is to be built from Saginaw to St. Charles and Durand, Mich., will touch about a dozen coal mines now in operation with about as many more contemplated, and it is the intention of the company to haul coal over the road. By this means it is said that the cost of hauling can be slightly reduced as against the present rates charged by the steam roads. The line will also be used for hauling sugar beets from the farms along the line to the factories in Bay County.

VISITORS to the Paris Exposition have been warned that they must guard against injury to their timepieces when they inspect the remarkable exhibition in the Palace of Electricity. This feature of the great fair is certain to be very popular, for the practical application of electricity to everyday uses is too recent a development of science to have lost its novelty, and the exhibition includes everything needed to illustrate the pregress of electrical discovery and the present uses of electricity in the arts and industries. There are large and small dynamos by the score developing the subtle current, and there are parts of the building into which watches cannot be carried without paralyzing their internal functions. In other words, the intense magnetic force developed is all pervading and magnetizes any steel that comes within the range of its influence. Watches stop entirely or work so poorly that they are useless. One of the Paris newspapers records the affliction thus visited upon the fine chronometer of Dr. Luys, whose watch was put out of service within five minutes after he entered the Palace of Electricity.

WILLIAM A. EDDY of Bayonne, N. J., found in a recent experiment that about three-quarters of the electric force which came down his kite-sustained steel wire was absorbed by the woodwork of the reel from which the wire was paid out upward. The sparks, with a six-foot kite floating at a height of 800 feet, were only one sixteenth of an inch in length, indicating that no storm was within many hundred miles to the north and westward. Mr. Eddy has long suspected that the woodwork of his reel was dissipating a good deal of electricity, in spite of the fact that dry wood is known to be a good non-conductor. He cut his kite wire and fastened the two ends together with silk cord which had been supplied by the Smithsonian Institution for reaching a great altitude with kites. It was found that electricity was unable to jump the gap filled in by the silk cord, but when a long iron rod which had been driven in the ground was made to approach the charged wire above the silk cord, half-inch sparks and one-inch discharges instantly appeared. During the afternoon in which the experiment was made little electricity was drawn from the upper air, and Mr. Eddy said there undoubtedly was no thunderstorm in the Southern States, since these always affect the wire with much greater intensity than

It is stated that the International Cable Directory Company has issued a telegraphic code and international cable directory, which is one of the most complete of its kind ever issued. In addition to the directory feature, its usefulness is greatly added to by the fact that it will be found in the offices of the Western Union Telegraph Company, and that it will be accessible in all parts of the world. The book has been adopted by the United States War Department, by the United States and Canadian Commissioners to the Paris Exposition, by the Canadian Government, and by about 11,000 banking, mercantile, and manufacturing concerns throughout the world.

THE "Elektrotechnische Rundschau" describes a new form of arc lamp which has recently been patented. It does not consume carbon rods like the ordinary lamp, but maintains its arc between platinum surfaces in a vacuum. The lamp consists of a glass bulb, in the interior of which, in place of the customary carbon rods, regulated by more or less complicated mechanism, are two L-shaped pieces of aluminum pointed with platinum. The arc plays between these in a vacuum, the bulb being exhausted highly. It is asserted that regulation, or rather starting the arc, for it requires no regulation, is accomplished by a simple pendulum motion of the bulb. The lamp is said to be shadowless, and the incandescent portions do not wear out.

According to the "Dry Goods Economist" X-rays have found a new field of employment in the silk industry. They have already been used to select cocoons and enable the observer to ascertain, without opening the cocoon, if the animal inside is of the male or female sex. The eggs which the female carries contain enough mineral matter to be detected by the process. A German chemist uses the X-rays to determine whether silk has been "weighted," and to what extent. As the weighting is done in black silks with salt or iron, the presence of these is easily discernible, and this method of detection may be employed in addition to the more complicated analysis or in place of it.

A DISPATCH from Sante Fé, N. M., states that S. G. Burn, manager of the Galisteo Company, operating on the Ortiz grant, has made the official announcement that the new Edison process of extracting gold from gravel by electricity at a cost of but a few cents per ton of gravel has proved a success at the experimental mill at Dolores. The nature of the process is kept secret.

# The New York Electrical Society.

At the annual meeting of the New York Electrical Society on June 14 the following officers were elected: President, T. Commerford Martin; vice-presidents, Arthur Williams, F. V. Henshaw, Stephen L. Coles, W. C. Burton, C. O. Baker, Jr., and S. L. Nicholson; secretary, George H. Guy, and treasurer, Henry A. Sinclair.

# The Independent Telephone Convention.

Large Attendance at Cleveland and Great Enthusiasm—Judge J. M. Thomas Re-elected
President—The Next Convention Will
Probably be Held in New York City.

The Fourth Annual Convention of the Independent Telephone Association of the United States, which was held last week in Cleveland, O., was probably the most successful gathering of independent telephone men yet held.

By Monday night, June 11, over 250 delegates had arrived and almost every train reaching Cleveland deposited others.

The headquarters of the Association, Room 301, Electric Building, was thrown open at 8 o'clock Tuesday morning for the purpose of registering and issuing credentials to the delegates and visitors.

### FIRST DAY'S SESSION.

The first session of the Convention was called to order at noon on June 12 in a specially prepared room on the first floor of the Electric Building. The address of welcome was delivered by Mr. J. B. Hoge, Secretary of the United States Long Distance Telephone Company, in which among other things he said:

"It is my pleasant duty and honor to represent the Cuyahoga Telephone Company and the United States Telephone Company this morning and to extend to each of you a welcome to our city and to make our offices your home while in the city.

"Our long distance lines reaching most points in the cities of Ohio make connection with independent exchanges in the States of New York and Pennsylvania on the east, Kentucky on the south, Indiana on the west, and Michigan on the north, and within the next few weeks we expect to be able to make connections with West Virginia. I cannot help but feel confident of the independent telephone companies' future. I think this is especially true so far as Ohio is concerned and many other States of the Central West. If there are any delegates here who represent States that have not been so well organized and developed, I hope that before they leave this Convention they will have received enough enthusiasm and interest in the matter to have resolved to return home and perfect an organization that will develop their State or at least have matters so well along that there will be no question of its future by the time this Association meets at its Fifth Convention."

President Thomas responded to Mr. Hoge's address and said in part:

"We have not always had the pleasure of meeting at places where entertainment was given by the local people, with the exception of what has been offered in the city of Chicago and the city of Detroit by the people who were directly interested. The first year the people of Detroit kindly entertained the Convention, the second year the city of Chicago offered no entertainment; however, the third year (last year) the manufacturers and material people of Chicago kindly donated a large fund for the entertainment of this Convention. The enjoyment of that Convention has passed into history, all remember it, and those who were not there to enjoy it certainly have heard about it, no matter in what part of the United States they were. That being the first effort, we might say, at general entertainment, we thought it would be wise (I am talking now as



an Ohio man), we thought it would be well to invite the Association to meet on Ohio soil this year, the proposition was made the Association to meet in the city of Cleveland, that it would not be at the expense of the Association, but at the expense of somebody else, and so you are here. I am not going to make any pledges for the local entertainment and for the Cuyahoga and United States Telephone Companies: those who know how they do things know that pledges are unnecessary. If any of you who stay through the entertainment and through all the sessions of this Convention are not satisfied at the close of the banquet on Thursday night, please step to the doorkeeper and he will refund the money that it cost you for the banquet and your supper."

The session adjourned about 1 o'clock.

The first, second and third floors of the Electric Building were given over to exhibitors of telephone supplies and materials. Each exlibitor occupied one or two rooms, and many attractive exhibits were shown.

At 4 o'clock in the afternoon many of the delegates accepted an invitation extended by the American Steel & Wire Company to visit the plants of the company located on the lake shore. The company provided special cars for the occasion, and there was a generous response to the invitation.

In the evening the Cuyahoga and United States Telephone Companies gave a reception to the delegates and visitors on the seventh floor of the Electric Building. The directors of the companies and their wives received the guests. The rooms were a perfect bower of beautiful flowers and an orchestra rendered excellent music. The building was brilliantly lighted for the occasion. Refreshments were served. The opportunity of inspecting the plant of the Cuyahoga Telephone Company was afforde i the visitors. The reception lasted until midnight.

# SECOND DAY'S SESSION.

The second session of the Convention was called to order by President Thomas shortly after ten o'clock on Wednesday morning, June 13. Judge Thomas delivered his annual address, which was in part as follows:

"We find since the last annual meeting, that the entire property of the American Bell Telephone Company has passed into the hands of the American Telephone and Telegraph Com-The organization of the Telephone, Telegraph and Cable Company of America, with offices in the city of New York, has attracted more attention in the telephone world than any single organization within the past

"There are now less than two and one-half million telephones in operation in the United States, counting both the Bell and independent systems. We believe that the present population of the United States will use 7,000,000 telephones at reasonable prices.

"The Bell Telephone Company were nearly twenty years in creating a demand for 582,506 telephones. Since the beginning of the independent telephone movement six years ago, nearly 2,000,000 telephones have been added to this number. It will take at least \$700,000,000 to install all the telephones that our present population requires.

'If the Bell licensees were not hampered by the short-sight d policy adopted in the bcginning of the American Bell Telephone Company, their companies would have advanced to a position that would have been almost impregnable before the independent telephone companies were permitted to enter the field , the past with the telegraph and mail service, by reason of the expiration of patents.

"The telephone business could not exist as a natural monopoly, but only existed as a monopoly as long as the laws of this country said the products of the genius of man should be protected. No business has ever thrived long as a monopoly without Government protection, until by perfect organization the thing has been placed within the reach of the people at prices below those that could be made by opposing companies.

"It is hard to comprehend that in this short time more than three thousand independent telephone exchanges have been out into organization, and that nearly one million telephones are now operated by independent telephone companies.

"If the conveyance of intelligence by wire is to be owned and controlled by one organization, let it be under the policy adopted by the independent telephone men of this country."

Following the address of the president, J. B. Ware, of Grand Rapids, Mich., general manager of the Citizens' Telephone Company of that city, read an interesting paper on the subject "Toll Line Traffic." Other papers read were as follows: "Telephone Development," Ed. L. Barber, president of the Northwestern Telephone Construction Company of Wauseon, O.: "Telephone Investments," Hon. Hugh Dougherty, president of the United Telephone and Telegraph Company of Bluffton, Ind.; "Our Duty to One Another," Hon. C. W. Kline, president of the Interstate Telephone and Telegraph Company of Philadelphia; "Telephone Construction," James E. Stewart, consulting engineer of the Telephone, Telegraph and Cable Company of America, of New York.

Mr. Dougherty's paper on the subject of "Telephone Investments" was addressed to investors principally and also to telephone companies and the public generally. He said in part: "I think all fair-minded men will admit that the telephone completes the triune of business necessities, viz., the mail, the telegraph and the telephone; the three great means of transmission of thought; the three giants that have annihilated distance.

"By means of the mail we may write our letter in secret, seal it up and post it, assured that no one may know its contents except the one who receives it. I consider this of vital importance to the future of the race; for if love-making were to cease by means of the mail, many a fellow, being too poor to pay the railroad fare to visit his best girl, would be shut out, as he would not dare to trust his love secrets to the average telegraph or telephone operator. This important feature of the mail service, together with the low rate of postage, insures its continuation.

"The telegraph is a necessity also for quick transmission of such business when a record is necessary, which may be used in the courts, and for the regulation and control of the movement of railroad trains.

"This insures the future use of the telegraph: while the telephone, the last but not least in the great triple alliance of contributors to the benefit, comfort and pleasure of the civilized world, takes the place to a great extent of both the other two, and at the same time affording many advantages possessed by neither the mail nor telegraph. This should satisfy investors of the necessity and of the permanency of the telephone.

"I think fifty years hence, as it has been in

the sphere of the telephone will be widened to an extent not dreamed of to-day, and all those who invest their money will be perfectly safe as far as permanency, stability and satisfactory profits are concerned."

The meeting adjourned shortly before 1 o'clock

In the afternoon the ladies attending the Convention were given a tally-ho ride through some of the parks and boulevards, with the compliments of the Williams-Abbott Electric Company. Unfortunately the weather was inclement and the ride had to be curtailed.

During the afternoon the exhibit rooms were thronged. The Convention was a profitable one for the manufacturers and material men. Many large sales are reported and negotiations for many more have been opened.

In the evening the visitors, delegates and ladies were pleasantly entertained at Haltnorth's Garden, the Cleveland Electric Railway Company furnishing special cars to and from the Garden.

#### THIRD DAY'S SESSION.

The meeting was called to order by President Thomas at 10 A.M. on Thursday, June 14. The following officers were elected for the ensuing year:

President—J. M. Thomas, Chillicothe, O. First Vice-President—Col. H. C. Young,

Columbia. Pa.
Second Vice-President—C. E. Stinson, Rochester. N. Y.
Thir I Vice-President—H. E. Teachout, Des Moines, Ia.

Secretary and Treasurer-S. P. Sheerin, In-

dianapolis, Ind.

First Assistant Secretary—R. F. Johnson, Saginaw, Mich.

Second Assistant Secretary—S. E. Wayland, Wilkes-Barre, Pa.

The only other business transacted at the meeting was of a routine nature. The selection of a place for holding the next annual Convention of the Association will be made some time next winter by the executive committee, which is comprised of one member from each State represented in the Association.

Tax Association has invitations from Chiago, New York, Saratoga and Niagara Falls: New York City, it is generally believed, will be s:lected.

The meeting adjourned at 1 o'clock.

In the afternoon the delegates, visitors and employes of the Cuyahoga and United States Telephone Companies were entertained with a boat ride on the lake. This trip was taken advantage of by a large number of the delcgates and visitors. The boat left the dock at 2 o'clock and returned at 6 o'clock. There was music, dancing and refreshments.

On their return the delegates and their friends were met at the dock by a band and were escorted to the Colonial Hotel, where the

banquet was served.

Hon. Harry D. Critchfield, general counsel of the United States Telephone Company, was the toastmaster at the banquet. The programme of toasts was as follows: "Our Guests," F. A. Henry of the Cuyahoga Telephone Comp ny, Cleveland; "Why are we Here?" Edwin R. Sharp, secretary of the Columbus Citizens' Telephone Company, Columbus: "Frogs' Legs," Hon. E. B. Fisher, of the Citizens' Telephone emone Company of Grand Rapids, Mich.: "Sne ik Currents," Hon. Z. S. Holbrook, president of the Massachusetts Telephone and Telegraph Company, Boston: "Patent Rights and People's Rights," Hon. S. P. Sheerin, president of the New Long Distance Telephone Company, Indianapolis. Several therinformal toasts were responded to by different members of the Association.

# TELEPHONY AND THE UNITED STATES PATENT QEFICE.

#### BY A. F. TENNILLE.

A word that is unknown to-day becomes a familiar sound to-morrow; a fact that has been hooted at in one generation is as though it had always been existent in the following one, and in no one branch of every-day life is this more clearly exemplified than in the telephone. The word "telephony" was first used in the year 1861, during the course of a lecture delivered by Philip Reis, before the Physical Society of Frankfort. The first person to work out a practical demonstration of that idea was Bell; yet to-day the telephone is a matter not of luxury but of necessity.

The earliest workers of whom we have any authentic information are Bell, Gray, Edison, Dolbear, Berliner, Frost, Hughes, and a few others. Of these, Bell was the first to bring the telephone forward as a matter of commercial importance, but this movement was quickly followed up by others who worked in connection with and at the same time that he did, and it is rather difficult to state with absolute certainty as to whom we are the most indebted.

The earliest models on file in the Patent Office are those of the year 1878, and comprise those secured by Bell, Berliner, Edison, G. B. Richmond and J. H. Irwin, and of these perhaps the most interesting models are those of the Edison telephone circuits and of the Doolittle switches.

In the following year we find added to these the names of Short, Watson, Irwin, Randal Cook, Gillett, Gilbert, Gray, Fitch and others, and so on through the passing decades these names have been increased. Some of the old inventors have grown weary by the way, and their names have dropped out of the struggle for gain and fame, but some of the best and oldest are with us, still striving after the unattainable—perfection—and their work has been augmented by that of some of the master minds of the mechanical world, as represented in the closing year of the century, such as Blake, Gower, Lundquist, Ericsson, Keith, Smith, Freudenberg, Berditschwesky and others.

Among the early models to be found in the model room at the Patent Office are those of A. K. Eaton, for a voltaic transmitting telephone, in which was the combination of a contact pass and a slide resistance pass on a flexible elastic tube, the diaphragm being held in place by central pressure only; a planchette system of receiving, by J. H. Irwin; the Edison telephone circuits and the Doolittle switches, both of which are magnificent specimens of mechanical genius; a model of the Gower-Bell patent, issued in 1880; switchboards by Frost, Andres, Lane and Palmer.

Among the most noteworthy models is that for an acoustic telegraph for which a patent was obtained by Irwin, in 1879; it consisted of a brass drum on a wooden shelf, and was a transmitting telphone, encased in a jacket of soft rubber, or other non-resonant material, in order to prevent the disturbing effect of echoes or extraneous sounds, combined with electro-magnetic sound producing apparatus, and which was provided with a switch to be operated at will.

Carbon telephones have received a great deal of attention at different times, and many efforts have been made to overcome the effect of time upon the carbon, by which the sound is gradually blurred. One of these was pat-

ented by Gilbert, another by F. K. Fitch, consisting of a combination in the telegraphic circuit, of two carbon plates, with their respective faces in constant contact; one of these plates was in proper form to be thrown into vibration by the direct impingement of the atmospheric sound waves therein, and by its vibrations in constant contact with the other plate, causing variations in the area of the voice, in contact, and consequently causing corresponding variations in the resistance of the circuit, the whole being placed in a chamber with yielding or elastic lining, the carbon plates being secured therein with their faces in contact with each other. Both of these patents were obtained in 1878, and in the same year patents were applied for by Bell and Gray, the latter being a peculiar model, strangely resembling telegraphic instruments of the same time, as did nearly all of the earlier telephone models submitted. In filing his application for a patent, Elisha Gray filed a brief with the department in which he called attention to models that were being submitted and to his own inventions, showing that sounds and spoken words might be transmitted to a distance by causing the vibrations of a diaphragm to vary the resistance in the circuit. This both Bell and Gray proposed to do by introducing a column of liquid into the circuit, the length or resistance of which could be varied by causing the vibrations of the diaphragm to vary the depth of immersion of a light rod fixed to it and dipping into the liquid, and this idea has perhaps been the most fruitful of any modification of telephonic apparatus introduced. It is rather curious to note that Gray and Bell entered their application for patents within two hours of each other, with the difference in favor of Bell. In Grav's application the statement is made that the application is taken out for a method of generating and transmitting telegraphically, in an electrical circuit, rhythmical electric undulations or vibrations by means of a current produced in the primary circuit, including an electro-magnet by the vibrations of the transmitter, whereby a special induction coil was claimed to be dispensed with. It included the combination of a battery and an electro-magnet in the main line; the transmitting telephone arranged in short circuit shunting the battery and the magnet from the main line, the receiving telephone in the long circuit. and the switch which simultaneously and by a single movement disconnects the transmitting telephone, short circuiting the receiving telephone and closes the main line, thus leaving the line free for calls.

In the same year we find models of an electrical contact telephone by Berliner, and an Edison model of a carbon telephone, an electric telephone whereby the sound was carried by a diminution of the pressure of the vibrations and of the elastic diaphragm. Phelps has a model of a switch and lever for same, both of iron and very heavy; A. M. Roseburgh and G. Black are represented by models of the order of telegraph instruments, A. Paris and J. G. Lange by signaling apparatus, H. A. · House by elaborate switches; Blake, E. T. Quimby and E. F. Frost are represented by models of switchboards, and Blake, Crawford, Dolbear, and Russell by various forms of transmitters.

At the present time the Patent Office does not require a working model, every detail is expected to be set forth in drawings, and only in the event that it is required for an examination of some detail in order to see whether it is operative, or when there are certain parts that cannot be readily demonstrated by a drawing, is a model asked for by the office. These calls are very rare, and there has not been any special model called for in some time. The drawings and accompanying descriptions are usually so complete that they can be easily understood.

An interesting point in telephony just now is the board divided central, and the means of signaling the operator in charge of the station from a given point. This method is somewhat of a departure from the old method of centrally installed circuits and is giving satisfaction in Germany, and perhaps in Austria as well.

Again it is stated that the relays have been unusually active for the past year or two. It is evident that there is a necessity for improvement in the matter of relays, and an evidence of this is found in the fact that, not so very long ago, one of the large Western telephone companies offered a large sum to any one who should submit to them an operative relay; as yet this has not been secured, and it is more than probable that this is the cause of the present activity along that line.

There is some activity in the art of wireless telephony at the present time, but it is not yet proven to be feasible, owing to the large inductance of the electro-magnet and the receiving device, and the obstacle to its success is the want of an operative receiving instrument that will not permit of interference.

The automatic telephone has always been a matter of interest to those interested in telephony, as indicated by the early models looking to that end, some of them quite unique in their design: for instance, a signaling apparatus for an automatic telephone invented in 1880 by J. S. Ross, of Nashville, Tenn., another by W. H. Day, and an elaborate model by Geo. H. Bliss, of Pittsfield, Mass., consisting of an electro-magnetic system, by which one station or a circuit could be called to the exclusion of all other stations by means of synchronously adjusted clocks at each and all stations, which would permit an alarm to be sent to one station at a time, and at the same time it would also be possible to short circuit a line current from all of the alarm magnets excepting the one to be rung up; it consisted of a clock or time train, signal bell, and an electro-magnet, to be operated on a main electrical circuit, a short circuit, and the whole governed by the electro-magnet to be operated by a battery of sufficient power.

At the present time there is an increased activity in the automatic telephone, and it is somewhat a matter of surprise that there are not more being used in the large cities. There have been some large companies that have installed different automatic systems in certain cities in Kentucky and Ohio, but in the majority of cases where they have been introduced they have been forced out later on by the old line telephone exchanges. Yet it is claimed by those interested in the automatic that it is steadily gaining ground. Another peculiar fact is that the automatic system seems to be adopted far more readily by the foreign countries than it is in the United States, although it is not quite clear why this should be so, particularly as the automatic systems invented by foreigners are not nearly so complete nor so well made and finished as those turned out by inventors in the United States.

Among those who have secured patents on



the automatic telephone in the United States have been Lundquist, Ericsson, Keith, Smith, also Seligmann-Ulei.

The patents owned by Mr. Smith cover the percentage system of automatic telephones; this system has a certain number of connecting lines which are to be used when any subscriber is wanted, and there are means for selecting any particular connection which may not be in use.

Applications made for patents to the Patent Office show that the percentage system is in favor with American inventors and there is good reason for this, as it seems to combine cheapness with simplicity.

Divided centrals are often used in connection with the automatic systems, the automatic devices being connected through connections at a central, and this central in turn selecting either a second central or a calling subscriber.

Quite animated discussions are being carried on between experts representing different companies that put in the multiple board system, and those that put in the divided central system, with reference to the readiness or satisfaction that is derived by the general public through the relative merits of the two systems. There are to-day really only three different systems. The first, or what may be termed the common battery system, wherein the talking and the signal battery are one and the same thing and are located at a central station, the current being controlled by a condenser, a receiver, and a subscriber's station.

The second is known as the local battery system, wherein the talking battery is located at the subscriber's station and is generally connected up in series with the induction coil and the transmitter of the subscriber, a transmitter carrying the variations of current, which in turn carries the impression on the line which leads to the call station.

There is not, strictly speaking, a distinctive third system; but there are several modifications or combinations of those already named, each with some distinctive feature introduced by the inventor, evidently for the purpose of trying to convey the impression that he knows something.

In the central board system the subscriber's lines are connected by the opposite, or on a parallel with each other, and are also inductively connected together through an induction coil to the battery.

The crossing of tracks between connective lines in the common battery system is prevented by the use of what are termed "impedance coils," which do not allow the telephonic current to pass through the battery to any other lines than those for which they are intended. In this way a single battery can be used for any and all subscribers talking at the same time.

One of the remarkable patents that have been issued through our Patent Office is that for a thermal telephone, issued to Stanley, and it would look as though it might have been issued more on the ground of its peculiarities than for its practicability; and which is based on the essential principles governing the thermo-pile. The contacts are arranged in series with each other, so that any set of contacts may form a single surface, which may be either hot or cold, and thereby produce an electric current.

In the divided central system an important feature is the selecting a particular plug by the subscriber to be used by the operator in

making connection with a called subscriber, and is similar to that in which the operator signals to a second central to use a certain plug connected with a special plug.

One of the most important patents issued during 1899 was that to Keith and Ericsson, for an automatic. The instrument is placed in a vertical position on a board, and the particular working model submitted to the office covered a system for a thousand subscribers, each of whom would be his own operator. The call plugs were divided into sets of ten in a row, one hundred in each section.

By this use of the automatic system there is an entire absence of leakage through the central which is, to say the least, very annoying, and sometimes more. It is a fact that is practically unknown that, during the Spanish-American war, when there was such a sharp rivalry among newspaper men that all sense of honor, individual and State, seemed to be at a discount, that a complete automatic system was installed in the McGill Building, G street, in Washington, and the President and each of his cabinet officers were supplied with an automatic telephone at their residences, and thus, during the entire progress of the war, when so much transpired that the outside world was not made acquainted with until the proper time, the President and his cabinet were in constant and private communication: the only person having anything to do with the telephones being the electrician in charge of the system. It is stated that the system gave the most complete satisfaction to all the parties concerned.

The most important inventors of the automatic telephone at the present time are J. G. Smith, Freudenberg, and his competitor, Berditschwesky, Keith and Ericsson, who seem to be working in conjunction with each other. American inventors are in the lead in the patents which have been issued for telephones and their accessories. They are closely followed by the German, English and French, the French and German inventors are along the line of chemistry in its connection with electricity, while the English inventors are more along the line of instrument makers, in which they are said to be most successful.

The theory and manipulation of the induction coil are two fields that are still capable of very exhaustive treatment by those who are able and have the opportunities to carry on work along that line.

For very much that is of interest on the work of the present in the telephone line, as contained in the foregoing remarks, credit is due to Mr. Crampton, who has charge of the telephone branch of the electrical department of the Patent Office.

# Artificial Fuel.

Advices from abroad state that the British Admiralty is about to arrange for a series of trials of artificial fuel, the two varieties being Welsh bituminous coal residuum bound with pitch or tar, and the other a mixture of anthracite coal and highly bituminous matters with tar made up into blocks of 22 lbs. each. A separate series of trials are to be made at different speeds, and with both natural draught and forced draught. There is a great disadvantage however in both kinds of fuel over ordinary anthracite coal, namely, that they produce intense volumes of black smoke. Ordinary anthracite is smokeless, but has the disadvantage that no one has hitherto been able

to form it into briquettes. A process has, however, now been worked out at Swansea, England, for making anthracite briquettes with the admixture of bituminous coal and the like, and a plant is about to be put down for turning out half a million tons a year.

# GOVERNMENT TELEPHONE SCHEME FOR LONDON.\*

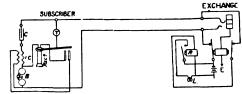
#### ((oncluded from page \$59)

The ducts will be built in cement to any required number and in different groupings. After a trench has been excavated to the required depth, 6 inches of concrete will be laid. in the center of which will be embedded one or two T-irons, according to the number of ducts in the group. After this concrete bed has set, the first tier of ducts will be laid, bedded in about half-an-inch of cement, and above this the second tier will be laid, also bedded in half-an-inch of cement, and so on for every subsequent tier till the nest is complete. On each side of a group of conduits there will be a wall of concrete, and above the top tier a layer of concrete. These side walls and the top layer of concrete will vary in thickness from 4 to 7 inches, according to the number of conduits in a trench.

In all cases these ducts will carry the main cables as distinguished from distribution cables, which will be branched off from the main cables at jointing chambers into cast-iron pipes.

#### JOINTING-CHAMBERS.

Jointing-chambers, or manholes, as they are more commonly termed, will be of two classes,



C, Condenser; 1C, Induction Coil; B, Bell; T, Transmitter; Recr., Receiver; R, Calling Relay; L, Calling Lamp.

Fig. 4.

one class for the roadway, and another for the footway. Roadway manholes will be larger, and constructed in a more substantial manner than any similar class of work yet attempted in this or possibly in any other country. They will be built of 14-inch brick-work in cement, roofed with steel troughing and steel joists, and the manhole entrance will have a cast-iron frame fitted with wooden blocks. The dimensions will vary with the number of cables to be brought into a manhole, but three standard sizes will be 4 feet wide, 8 feet long and 5 feet 6 inches deep (to take 18 cables); 5 feet 6 inches x 8 feet x 6 feet (to take 28 cables); and 7 feet x 8 feet x 6 feet (to take over 28). For the city work the last named will be the most common size used, but there will no doubt be some special manholes of larger dimensions.

The footway manholes will be of 9-inch work, with York stone roofs resting on light steel joists, with the ordinary cover frames with stone slabs. The dimensions of this class of manhole will be considerably less than those for roadway work, and will be governed more by the space available than by the number of cables.

The large manholes in roadway and footway are for the main cable work, and are to be built at an average distance apart of 150 yards, but of necessity the intervals between the

<sup>•</sup> From the "Electrical Review," London,



manholes in the city will be much less in many cases. These main jointing-chambers, when they are in the roadway, are to be connected with each footway, and when the manhole is in one footway it is to be connected with the opposite footway. In both cases the connection will be made by means of cast-iron pipes.

These connecting pipes will contain the cables which are to be used for distribution purposes, and which will be carried along the footways in cast-iron pipes. At intervals depending on the number of subscribers on the various routes small boxes will be fixed in the footway, and from these the cables or wires to serve subscribers will be carried into the buildings.

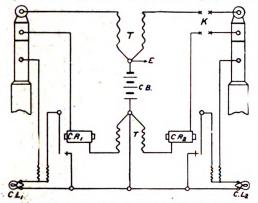
#### SWITCHBOARDS.

The switchboards for the Central Exchange will be fitted to accommodate 10,000 subscribers, whilst the switchboard for what may be termed the "inner" sub-exchanges, such as Westminster and Kensington, will have a capacity of 2,000, but will be so constructed as to admit of their being added to as business develops.

For the "outer" sub-exchanges the switchboards will, as a rule, have an original capacity of 600, but will be made so that additional "panels" may be added as required.

#### CENTRAL BATTERY SYSTEM.

The system of working to be adopted in the City Exchange and the inner sub-exchanges will be that known as the "central battery system." As the title implies, a central or common battery, usually 24 volts, is fixed at the exchange, so that no battery is required at a renter's office. This mode of working is especially adapted for large exchanges, where



T, Transformer; CB, Common Battery; CR<sub>1</sub>, CR<sub>2</sub>, Clearing Relays; CL<sub>1</sub>, CL<sub>2</sub>, Clearing lamps; K, Speaking and Ringing Keys.

Fig. 5.

secondary cells are available and where the subscribers' circuits do not exceed two miles in length. Under such conditions this system of working is very efficient. For the outer sub-exchanges and for long subscribers' lines the common battery system will be employed.

In central battery working the apparatus arrangements are such that when the receiver at the subscriber's end is on its hook the circuit there is not continuous, but is made through a condenser and magneto bell (this is to admit of a call being received), whilst at the exchange end the lines are joined together through a relay and battery. The action of lifting the receiver by a subscriber makes the circuit continuous through the speaking apparatus. This sends a current through the exchange relay, and thus causes a lamp to light, so gaining the attention of the operator automatically.

At the exchange the cords used for making connections have transformers joined across

them, the coils of these transformers being di vided at their middle points, and between the halves of the coils the common battery is placed. These transformers and the common battery thus respectively take the place and fulfill the function of the induction coil and battery which are required at the subscriber's end for the speaking circuit in the ordinary system of working. In the common battery system there is still an induction coil in the subscriber's telephone set, but its function is a "hearing," not a "speaking" one. ing "lamps are connected up with the cords in such a way that the act of replacing the subscriber's receiver upon the hook automatically causes a lamp to light, and the operator disconnects, thus restoring the subscriber's line to the normal:

ELECTRICITY.

Figs. 4 and 5 show diagrammatically the connections at the subscriber's end and at the exchange.

This system has been extensively adopted in the United States with excellent results. It has several advantages. The signaling is entirely automatic, and this reduces to a minimum the demand upon the time, patience and technical knowledge both of the renter and the exchange operator; the absence of batteries from the subscriber's office saves the space usually allotted to these articles, which are often looked upon as objectionable adjuncts to the telephone, and hitherto tolerated simply because they have been considered indispensa-Further, as the majority of faults at the subscriber's end are at present found to be in the battery circuit, the subscriber will be less troubled by visits from a lineman, and, incidentally, it may be remarked that this means to the Post Office a saving in skilled labor and in battery materials.

#### RATES.

The Post Office telephone rates for London have not yet been published, but they will probably be based on the "toll" rate system already announced by the Post Office for the provinces, as against the "flat" rate system which has hitherto been in vogue in this country. The annual rental quoted by the Post Office for provincial towns is £5 to cover 500 free calls, with a small graded charge for calls beyond that number.

The toll system will obviously appeal at once to the small users of the telephone. It will undoubtedly, however, very shortly find favor with large users as well, for it will have a tendency to induce the renter, but more particularly his staff, to be more careful with "calls," Under the present flat rate system indiscriminate use is made of the telephone by all and sundry. Even the office-boy does his "little talk" by means of it. The result is that many business calls are postponed or canceled altogether, and the interests of the firm suffer in consequence. This has been borne out by statistics from America and Switzerland, which proved that with a flat rate system the percentage of "ineffective" calls greatly exceeded the number under the toll rate system which is now in vogue in both these countries.

In America it is found that more real business is done, and more expeditiously done, under the new régime, than under the old. It is, therefore, safe to assume that a system which has commended itself to the sharp business men of America, a country which is, by the way, at present much ahead of us in matters telephonic, will soon become popular with the commercial community on this side of the Atlantic.

# THE SAFETY SYSTEM OF ELECTRIC WATER-TIGHT DOORS

A modern sea-going steamship, whether battleship or of the merchant marine, would undoubtedly be considered unsafe if it were not provided with water-tight bulkheads, dividing its hull into several distinct compartments. Inasmuch as the ultimate efficiency of such water-tight compartments depends upon their integrity when an emergency arises, and as every bulkhead is pierced below the water line by one or more openings for entrance and egress, it becomes of the greatest importance to have these openings provided with doors that may be closed quickly, conveniently and surely.

Aside from doors operated solely by hand—and the inadequacy of these has been fully demonstrated—there are now known three methods or systems of power-operated doors: 1, hydraulic; 2. pneumatic; 3, electric.

Doors controlled hydraulically have been tried experimentally upon a United States crusier. These served to demonstrate very clearly the important advantages of a power

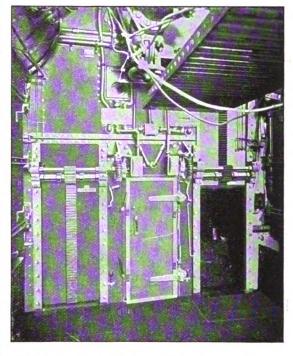


FIG. 1.—INSTALLATION ON U. S. S. ATLANTA

door, but owing to many difficulties inherent with the system, hydraulic control has been abandoned.

Pneumatic doors are now in an experimental stage. The difficulties attendant upon this mode of control are quite as numerous and as serious as with the hydraulic.

The electrically operated safety-door here described is the invention of Naval Constructor Francis T. Bowles, U. S. N., and is manufactured by the Sprague Electric Company of New York.

The safety system meets perfectly every requirement for a bulkhead door that has been outlined by authorities on this subject, or found desirable from experience.

First—The door can be raised or lowered by power or by hand, by one operator at the door on either side of the bulkhead.

Second—It will close either against a rush of water or against a rush of mixed water and coal, or through coal on the other door sill due to the first opening of a full bunker.

Third-It is possible to close by power from

the bridge, or from one or more central or emergency stations, any desired group of doors, or all the doors simultaneously, or in any degree of succession.

Fourth-There is at each emergency station a positive and reliable indicator by which the closure of each door is made known.

Fifth-The operation of the emergency closing in no way interferes with the local operation by hand or power.

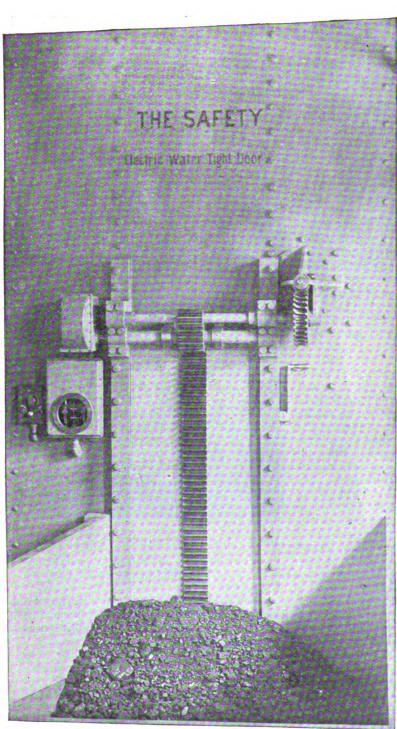
Eighth-The doors have no tendency to "creep," and will remain in any position without expenditure of power to hold them.

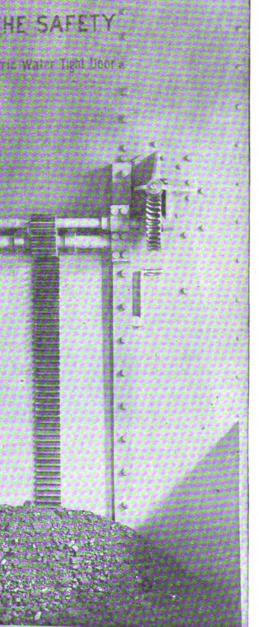
Ninth-The power is taken from the main generating plant of the ship, and requires no auxiliary central station or apparatus under continual and wasteful operation.

Tenth-There are no valves, springs or packng, which are subject to continual deterioration and require constant care.

frame, and all sliding parts and bearings, are bronze. The motor and controlling mechanism are enclosed in bronze water-tight cases which protect them from mechanical injury and from water. The driving mechanism occupies but little space, and the controlling apparatus can be so located as to avoid interference with other apparatus.

The sliding portion of the door is of steel plate, with bronze rim and rack. The frame





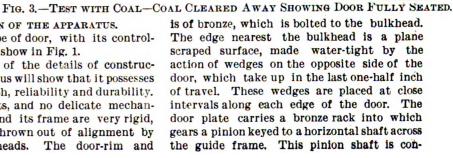
Sixth-The local control by power has pre-

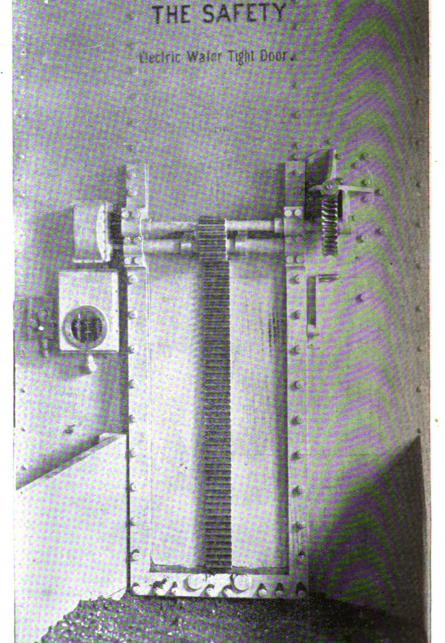
Fig. 2.--Test with Coal-Door Closed Through Coal.

DESCRIPTION OF THE APPARATUS.

The vertical type of door, with its controlling mechanism is show in Fig. 1.

A consideration of the details of construction of the apparatus will show that it possesses simplicity, strength, reliability and durability. There are few parts, and no delicate mechanisms. The door and its frame are very rigid, and will not be thrown out of alignment by warping of bulkheads. The door-rim and





cedence over the emergency closure, so that in-

dependent of such closure, a door may be stopped or opened for egress. After the local switch is released the emergency again assumes control and closes the door.

Seventh-The leads which supply power, and which control the doors as well as the operating mechanism, are unaffected by any temperature conditions existing on board ship.

nected through a worm wheel and worm to a shaft extending through the bulkhead, and upon which is mounted the motor armature. For hand operation, cranks are provided which ship over the hexagonal ends of the worm shaft on either side of the bulkhead.

The motor is specially built and wound, so that in ordinary use the power required to raise or lower the door is very small, but when the sill is covered by coal or other obstruction, it is capable of exerting a very powerful effort and will drive the door to its seat.

The controlling mechanism includes:—Controller, hand switch, automatic limit switch and emergency switch.

The controller consists of two magnetic switches which govern the circuits of the driving motor. The switches are closed electrically, and are opened by gravity when the current is cut off. One switch controls the upward, and the other the downward motion. The only moving portions of this controller are the solenoid "plungers," which carry solid copper contacts on flexible phosphor-bronze springs. These contacts make up against carbon blocks held in solid studs. All arcing when the motor circuit is broken is taken on these carbon blocks, which, as the carbon wears away from continued use, can be adjusted in their studs.

The contact with the carbons is independent of this wear, over wide range, on account of the copper contacts being mounted on flexible springs.

There are no pivots or pin joints, and no delicate springs or parts that require skill in adjusting.

The hand switch is a three-point switch operated by a shaft that passes through the bulkhead and carries a handle on each side. A movement of the switch handle to the right or left is all that is required to operate the door up or down. As long as the handle is held in one or the other position, the door continues to move. When released it is returned to its central position by a spiral spring and the door is immediately stopped. The contacts are simple and sure, and the handle is made especially heavy to withstand rough useage.

The automatic limit switch consists of two arms carried on a shaft which is connected to and driven by the main pinion shaft of the door. These two arms engage with switches which are opened, cutting off current and thus stopping the motor, when the door has reached its extreme upper or lower positions. These arms are adjustable upon their shaft so that the limits of motion of the door can be accurately determined when installed. After being adjusted, no further care is required.

The emergency switch, for closing the door from a distant point, consists of a standard push-button snap switch placed in a suitable case, which also contains the indicator. This is a small incandescent lamp, which, when lit, illuminates the circular glass "bull's eye."

All connecting wires from each electric fixture are brought to a central junction box, which forms a central station for connecting the circuits or testing them out. All enclosing boxes are fitted for receiving iron pipe connections.

## TRIALS.

A vertical door was erected in 1899 for trial tests at the Brooklyn Navy Yard. This was subjected to the most severe tests, extending over long periods, all of which it withstood most successfully. Without a particle of at-

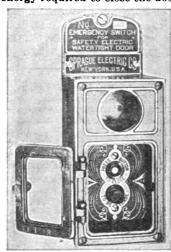
tention or adjustment, the door was operated many times a day for five months, and was closed many times through coal piled over the sill and through other obstructions.

Figs. 2 and 3 illustrate these tests. This same door, without any change or repairs whatever, has been sent to the Paris Exposition, at the request of and under the auspices of the U. S. Government.

After an exhaustive test and examination by a special commission appointed by the Secretary of the Navy, these doors were recommended for and installed upon the U. S. S. "Atlanta," where they are now in service. Installations have been made also on the S. S. "St. Paul" of the International Navigation Company and others are in progress and under advisement.

The power required to operate a single door will depend upon the speed at which it is desired to open or close. The following are power requirements for a vertical door arranged to open in 8 seconds and close in 9 seconds: To start the door down, 13 amperes or 1.43 kilowatts for ½ second; while closing, 3 amperes or .33 kilowatts for 8½ seconds; to start the door up, 18 amperes or 1.98 kilowatts for ½ second; while opening, 8 amperes or .83 kilowatts for ½ seconds—all at 110 volts.

The energy required to close the door is thus



EMERGENCY SWITCH FOR ONE DOOR.

only .978 watt hours, or about the equivalent of burning one 16-candle-power lamp for one minute. The total energy required to operate one door or a system of doors is, therefore, negligible in the determination of the size of the ship's dynamos.

The instantaneous demand for closing the the door at its start is, as per above test, 1.43 kilowatts, for one-half second.

The total instantaneous demand for a system of doors should not, however, be based on this figure. As the system can be so arranged that one or any number of doors are controlled by a single emergency switch, the best grouping for the given conditions is selected and the total power demand at any moment will depend upon the number of doors operated by a single switch. The maximum demand for power at any moment can, by suitable grouping, be made as small as desired.

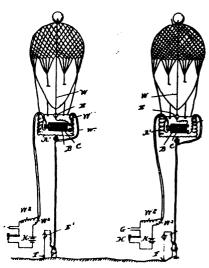
With a system of 12 doors, in which three doors are operated by one emergency switch, making four groups and four emergency switches, the total instantaneous demand of power would not exceed seven kilowatts when the emergency switches are closed at the rate of two per second, which requires very rapid movement on the part of the operator. This power is required for a period of but one-half

second, and the steady total load of twelve doors under these conditions is 3.96 kilowatts for eight seconds. Since each door must be opened individually by the local door switch, the power demand in opening can never be as great as when closing under emergency conditions. In special cases, where the power supply is so limited as to make it desirable, a special throttling device is provided which automatically and absolutely prevents more than a given rate of power supply to the door system.

The effect of this device is to extend the period of closure of the entire system and does not affect the power with which any single door will close, or the certainty that all will close.

# Wireless Telegraphy.

Patents on a system of wireless or space telegraphy were granted last week to Isidor Kitsee of Philadelphia, Pa., which embody several rather novel features, as may be seen by a glance at the accompanying illustration. What the



inventor lays claim to is "in wireless or space telegraphy, an automatic sending station comprising a buoy, a voltaic pile or couple adapted to be immersed in the sea-water, means electrically connected with said pile or couple for making and breaking the circuit at prearranged intervals, a primary coil and an interrupter in circuit with said pile or couple and said circuit making and breaking means, an aerial conductor, and a secondary coil in circuit with said conductor."

# CANADIAN NOTES.

(From our Ottawa Correspondent.)

Arrangements are on foot for the development of an automobile factory in Ottawa. A number of gentlemen from Toronto, Ont., interested in the enterprise, have been at the Canadian capital looking over the ground. The establishment will be the Canadian branch of an American firm engaged in the manufacture of these vehicles.

Prof. V. L. Emerson, the American scientist who discovered the process of converting sawdust and mill refuse into calcium carbide, and who is at present a resident of Ottawa, is now at work in that city on what he claims will be the fastest and most powerful automobile ever constructed. The machine will be operated by a hydro-carbon motor, that is by the explosion of gases made from liquid fuel. The steering will be done by an attachment to the rear wheels. Mr. Emerson has built a double cylinder motor, and he expects to develop between



thirty and forty horse-power. The weight of the automobile when finished, it is estimated, will be 1,100 pounds. The pressure at the point of explosion will be 380 pounds, and, with the machine he is building, Mr. Emerson will have gearing designed for a speed of 30 miles an hour. The gears will be made so that the automobile can be run either slowly or fast as desired. If necessary, Mr. Emerson claims that he can run the machine fully 60 miles an hour. The axles will be two inches in diameter, and, in addition to steel springs, a pneumatic spring which Mr. Emerson has invented will be used. The wheels will have rubber tires five inches in diameter with steel rims, and the wheels will be 36 inches in diameter. The reason for putting on such thick tires is to prevent roughness in running over the ordinary roads around the city. Mr. Emerson expects to have the automobile built in a few weeks, the motor being already available. The motor will be placed in the front of the vehicle and room for baggage in the rear will be provided. It is expected that the machine will run for a distance of 150 miles without recharging.

In connection with a London cable recently, in which it is claimed for the dentist Zierler (while experimenting at the Hygienic Institute at Wurzburg) the discovery of a successful application of electricity for the destruction of bacteria in the human system, the announcement is made that a Canadian physician, and a member of the profession in Ottawa, has been conducting for some time careful and original investigation into the influence of electricity in the cure of consumption, and quite independent of the announcement respecting Zierler. The practical results of these experiments will shortly be placed before the public.

## LEGAL NOTES.

Judge Kohlsaat recently appointed Charles Henrotin receiver of the Chicago Electric Traction Company, which operates cars beween Englewood and Blue Island, Ill. Mr. H inrotin has filed a \$25,000 bond.

Benson Bilwell, of Chicago, began suit a siort time ago in the Federal Court against the Indianapolis Street Rullway Company and the Citizens' Street Railway Company of Indianipolis, Ind., for \$50,000 damages for infringement of a patent. Mr. Bidwell is the holder of patents issued to him at Washington, May 26, 1885, which he claims cover every device used to day in the operation of a trolley ctr. He claims to be the original inventor of the trolley system and that he has been cheated out of his rights. The particular point upon which the present suit is based is the method used of lighting the cars from the same current by which they are propelled, which Mr. Bidwell claims is in direct infringement of his patent.

Judge Waddill, of the United States Circuit Court at Richmond, Va., upon application of the holders of \$393,000 of the \$400,000 first mortgage 5 per cent. bonds of the Richmond & Manchester Rilway Company, has lately granted an order appointing a receiver for that company.

#### Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended June 9:

Antwerp. 2 cases, \$15; 9 packages, \$2,993; Argentine Republic, 30 cases, \$1,914; Barcelona, 5 packages, \$110; Brazil, 169 packages, \$10,297; Bristol, 41 cases, \$4,500; 52 electric cable reels, \$6,945; British West Indies, 35 packages, \$111; Brussels, 1 case, \$418; Central America, 27 cases, \$714; Chili, 12 packages, \$449; Cuba, 26 packages, \$474; Ecuador, 1 case, \$37; Hamburg,

36 cases, \$1,260; Havre, 9 packages, \$985; Liverpool, 297 packages, \$23,392: 11 cases, \$1,380; London, 237 packages, \$16,799; Manchester, 6 cases, \$1,500; 7 packages, \$21,165; Margate, 8 cases, \$3,100: Peru, 12 cases, \$2,280: 13 packages, \$2,073; Porto Rico, 19 packages, \$377; Santo Domingo, 7 packages, \$444; Southampton, 2 packages, \$950; 75 cases, \$1,256; U.S. Colombia, 3 cases, \$71: Venezuela, 26 packages, \$53.

The following were the exports from the port of New York for the week ended June 16:

Alexandria, 32 packages, \$1,359; Antwerp, 33 packages, \$2,361; Argentine Republic, 74 cases, \$3,626; Australia, 93 packages, \$15,591; 97 cases, \$10,387; Brazil, 6 cases, \$292; Bremen, 10 cases, \$800; British East Indies, 28 packages, \$1,507; British West Indies, 16 cases, \$551; Brussels, 5 cases, \$240; China, 1 case, \$58; Christiana, 1 case, \$16; Cuba, 1 case, \$58; Ecuador, 26 packages, \$255; Florence, 10 packages, \$1,298; Genoa, 4 cases, \$94; Glasgow, 142 cases, \$20,124; Hamburg, 84 packages, \$5,753; 2 cases, \$13; Havre, 1 case, \$3,250; 152 packages, \$30,779; 6 cases electric carriages, \$7,250; Japan, 532 cases, \$33,229; Leipsic,8 cases,\$500; Lisbon,150 packages,\$9,034; Liverpool, 102 cases, \$14,052; 5 packages, \$156; London, 216 packages, \$30,307; 4 automobiles, \$1,200; Malta, 2 cases, \$36; Marseilles, 135 cases, \$11,515; Mexico, 34 cases, \$8,703; 12 parts of automobiles, \$2,525; Naples, 9 packages, \$1,200; New Castle, \$120; New Zealand, 1 case, \$112; 3 packages, \$68; Peru, 10 cases, \$420; St. Helena, 70 packages, \$1,015; Venezuela, 3 packages, \$51.

#### PERSONAL MENTION.

Mr. A. E. Waldron has recently accepted the superintendency of the electric light plant at Elmira, N. Y.

Mr. James Kent, general manager of the Canadian Pacific Railroad Telegraphs, left Montreal for the Pacific Coast a short time ago on an inspection tour, during which he will visit the principal telegraph offices on the system.

Mr. Charles Oliver, Government Railroad Commissioner of Sydney, New South Wales, is making a tour of this country, inspecting the railroad and electric street railway tems. He intends to purchase a complete electric light and power plant in order to duplicate plants now in operation in Sydney, Melbourne and other cities of Australia.

## INCORPORATIONS.

The Sayville Electric Company, Islip, N. Y. Capital stock, \$15,000. Directors; Daniel D. White, J. H. Green, Jr., Francis Gerber, Joseph A. Nauert and Sewell Thornhill, all of Savville.

The Massachusetts Power Company, Jersey City, N. J.-to supply electric power. Capital stock. \$750,000. Incorpora-R. M. Wiers, R. S. Checkley, K. A. Hammerer; R. M. Wiers & Co., attorneys, New York.

The Corporate Investment Company, Trenton, N. J .-- to manufacture and deal in all kinds of power and lighting, to build reservoirs and electrical apparatus, and operate railroads and canals. Capital stock, \$2,000,000. Incorporators: George Walbridge, S. Kingsbury Curtis, H. S. Collette, R. B. Marchant, George X. McLaughan and Charles L. Bartow, all of New York.

The Needham Electric Company, Needham, Mass.-te furnish electric light and power. Capital stock, \$15,000. Incorporators: W. W. Carter, C. H. Carter and F. B. Carter.

The Masontown Electric Light, Heat & Power Company, Masontown, Pa. Capital stock, \$10,000.

The Altha Automobile & Power Company of New York City-to make and deal in automobile goods and other kinds of vehicles propelled by electricity, steam or compressed air. Capital stock \$500,000.

The Standard Electric Light Company, Kansas City, Kan-Capital stock, \$25,000. Directors: L. E. James, W. J. Buchan, James Fennel, C. F. Holmes and W. E. Kirkpatrick.

The Shawmut Construction Company. New York City-to build and equip railroads and general electrical plants. Capital stock, \$150,000.

The Consumers' Electric Light & Power Company, Phillipsburg, N. J.—to deal in electricity. Capital stock, \$100,000. Incorporators: J. W. Cornell, H. S. Cavanaugh, W. H. Walters, all of Easton.

# ELECTRICAL PATENT RECORD.

This department is edited by OSCAR A. MICHEL. Solielton and Attorney for AMERICAN AND FOREIGN PATENTS, at 503 and 504 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents. Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 308-304 Broadway, New York City, N. Y., or 639 F street, N.W., Washington, D. C. Copies of any patent published can be furnished upon payten cents. When ordering give name, date and title of invention wanted.

#### LETTERS PATENT ISSUED JUNE 5, 1900.

# ELECTRIC RAILWAYS AND APPLIANCES.

650.878. Trolley. Francis B. Torrey, Bridgeport, Conn. Filed Aug 16, 1899.
650.881. Street Car Fender. Alphonse Veglard dit Labonte and Joseph A. I. Craig. Montreal. Can. assignors of one-third to Gilbert Vegiard dit Labonte; said Craig assignor of his remaining right to Marie Marguerite Philomene Craig, same place. Filed Dec. 9, 1899.

Craig, same pla 650,904, Trolley, Dec. 20, 1899, 650,929, Contact-B Charles H. McGwire, Denver, Col. Filed

Dec. 20, 1899.

650,629. Contact-Box for Electric Railways. Alfredo Diatto, Turin. Italy. Filed July 30, 1898.

650,629. Contact-Box for Electric Railways. Alfredo Diatto, Turin. Italy. Filed July 30, 1898.

650,992. Electric-Railway System. William Robinson, Boston, Mass. Filed Feb. 22, 1898.

650,997. Electric Railway System. James M. Taylor, Omaha, Neb. Filed Aug. 29, 1899.

651,055. Trolley. William B. Potter, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Jan. 11 1898.

651,112. Electric Controller for Railway-Switches. Hermann A. Gorn, New York City. Filed Oct. 19, 1899.

651,239. Car Fender. Thomas McGovern, New York City. Filed March 31, 1899. Renewed Nov. 7, 1899.

651,239. Electric Railway Rail-Bond. Thomas J. McTighe, New York City. Filed Aug. 30, 1899. Renewed May 11, 1990.

651,271. Electric-Railroad. Switch. Thomas A. Phodos. Telegraphers.

1990. 271. Electric Railroad, Switch. Thomas A. Rhodes, Jr., Langdon, D. C. Filed Feb. 8, 1900.

#### ELECTRIC LIGHTS AND APPLIANCES.

650,872 Electric-Arc Lamp. William L. Silvey, Dayton, Ohio. Filed Nov. 27, 1899.
650,888. Electric-Arc Lamp. James J. Wood, Fort Wayne, Ind. Filed Oct. 10, 1889.
650,905. Electrical Glow-Light with Second-Class Conductors. Karl Ochs, Berlin. Germany. Filed Sept. 16, 1899.
651,338. Carbon and Globe Holder for Arc-Lamps Adolph Holliger, New York City. Filed Aug. 2, 1899. Renewed May 8, 1900. Holliger, Ne May 8, 1900.

# ELECTRICAL MACHINERY AND APPARATUS.

995. Electric Punka-Motor. Heinrich Spuhl, St. Gall. Switzerland. Filed March 8, 1900.

## TELEPHONES AND TELEPHONE APPARATUS.

650,915. Relay for Telephone-Lines. Charles E. Scribner, Chicago, and Frank R. McBerty, Downer's Grove, Ill., assignors to the Western Electric Company, Chicago, Ill. Filed Feb. 14, 1898.
651,179 Germ-Arrester for Mouthpieces of Telephones. Speaking Tubes, etc. Charles J. Branch, Philadelpha, Pa. Filed Nov. 21, 1899.
651,198. Telephone-Transmitter. Joseph M. Moore, Charles

198. Telephone-Transmitter. Joseph M. Moore, Chatham, Ill. Filed Sept. 23, 1899.

# MISCELLANEOUS.

ham, Ill. Filed Sept. 23, 1899.

650,830. Day Signaling Apparatus. Bradley A. Fiske, U. S. Navy, assignor to the Western Electric Company, Chicago, Ill. Filed March 16, 1898.
650,835. Telegraph-Sounder. Francis Hatmaker, Pittstown, Pa. Filed July 31, 1899.
650,842. Electrically-Controlled Winding Mechanism for Time-Locks. William H. Hollar and Alonzo L. Rhodes, Philadelphia, Pa.; said Rhodes assignor to said Hollar. Filed March 10, 1899.
650,860-650,861. Electrical Connector and Method of Making Same. Thomas J. McTighe, New York City. Filed Feb. 27, 1900, March 30, 1900.
650,862. Electrical Connector and Method of Making Same. Thomas J. McTighe, New York City. Original application filed Feb. 27, 1900. Divided and this application filed March 30, 1900.
650,855. Electric Storage Battery and Conducting Plate Therefor. S. Lloyd Wiegand. Philadelphia, Pa. Filed June 5, 1897. Renewed Oct. 30, 1899.
650,886. Secondary Battery. S. Lloyd Wiegand, Philadelphia, Pa. Filed Nov. 28, 1899.
650,928. Suspension-Clamp for Electric Conductors. Isaac J. Crowley. Chicago, Ill. Filed July 8, 1899.
650,928. Electric Conductor. Louis Hackethal, Hanover, Germany. Filed Dec. 20, 1898.
650,973. Electrical System for Water-Tight Doors. George H. Hill, East Orange N. J., assignor to Francis Tiffany Bowles, New York City. Filed Dec. 29, 1899.
650,987. Electric Conductor. Oscar P. Ostergren, New York City. Filed Dec. 28, 1899.
651,033. Electric Telegraphy. Isidor Kitsee, Philadelphia, Pa., assignor to Charles E. Wilson, same place. Filed May 20, 1896.
651,044. Space Telegraphy. Isidor Kitsee and Charles E. Wilson, Philadelphia, Pa. asid Kitsee assignor to said Wilson. Filed May 25, 1899.
651,044. Time-Damper-Operating Mechanism. Warren D. King, Peabody, Mass. Original application filed March 30, 1900.

1633. Insulated Contact or Terminal for Electric Circuits. Charles C. Badeau, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed March 30, 1900



- 651,076. Gramophone. Eldridge R. Johnson, Philadelphia, Pa. Filed Feb. 3, 1829.
  651,088. Process of Producing Positive Plates for Batteries. Hans Strecker, Cologne. Germany. Filed May 12, 1849.
  651,135. Instrument for Determining Amount of Elongation and Compression of Railway-Rails Under Moving Trains. Plimmon H. Dudley, New York City. Filed Jan. 13, 1898.
  651,136. Instrument for Testing Rails Under Moving Trains. Plimmon H. Dudley, New York City.
- Trains. Pimmon H. Dudley, New York City. Filed Jan. 13, 1806.
  651,136 Instrument for Testing Rails Under Moving Trains. Plimmon H. Dudley, New York City. Filed Nov. 10, 1808.
  651,143. Ccupling for Cable Ends. John C. Kurtz, Dayton, Ohio. Filed March 19, 1900.
  651,163. System of Day Signaling. Bradley A. Fiske, U. S. N., assignor to the Western Electric Company, Chicago, Ill. Filed Aug. 21, 1890.
  651,247. Chemical Electric Generator. Henry K. Hess. Syracuse, N. Y., assignor to Herman J. Dercum, trustee, Philadelphia, Pa. Filed Aug. 31, 1896.
  651,308. Graphophone Sound-Box. William Hart, Kirksville, Mo. Filed July 22, 1899.
  651,325. Electric Burglar-Alarm System. John F. Dorsey, Washington, D. C., assignor of one half to Robert G. Callum, same place, Filed Oct. 7, 1899.
  651,326. Electrical Hose-Signaling Apparatus. William Fowler, Colorado Springs, Col. Filed March 13, 1900.

#### LETTERS PATENT INSUED JUNE 12, 1900.

#### ELECTRIC RAILWAYS AND APPLIANCES.

- ELECTRIC RAILWAYS AND APPLIANCES.

  651,836. Electric-Railway Axle. Henry M. Brinckerhoff and James S. Doyle, Chicago, Ill. Filed Aug. 7, 1899.

  651,338. Electric Railway. Theophilus P. Chandler, Philadelphia, Pa. Filed March 10, 1900.

  651,350. Electric Railway. William Grunow, Jr., Bridgeport, Conn. Filed Feb. 17, 1899.

  651,401. Trolley. John H. Walker, Lexington, Ky. Filed July 24, 1899.

  651,541. Electric Railway. Augost Casazza, Hoboken, N. J. Filed June 10, 1899.

  651,552. Electric Railway. Filed April 12, 1900.

  651,553. Trolley. Frank A. Merrick, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Sept. 14, 1899.

  651,602. Brake Mechanism for Electric Railway Cars. Frank W. Garrett, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Sept. 16, 1899.

  ELECTRIC LIGHTS AND APPLIANCES.

#### ELECTRIC LIGHTS AND APPLIANCES.

- ELECTRIC LIGHTS AND APPLIANCES.
  651,478. Electric Light Dimmer. Frank E. Woodford, Appleton, Wis. Filed Sept. 20, 1898.
  651,498. Electric Arc Lamp. Emile Bonhivers, Levallois-Perret, France. Filed Jan. 2, 1900.
  651,696. Contact for Incandescent Lamp Bases. etc. Waldo C. Bryant, Bridgeport. Conn., assignor to the Bryant Electric Company, same place. Filed Dec. 13, 1898.
  651,733. Electric-Arc Lamp. William F. Wegner, West Superior, Wis. assignor of three-fourths to Daniel E. Ford, Henry J. Connor and Hervey W. Dietrich, same place. Filed March 12, 1900.
  ELECTRICAL MACHINERY, AND ARGADATUS.

# ELECTRICAL MACHINERY AND APPARATUS.

- 651,595 Electric Switch. William Ely, Providence, R. I. Filed Feb. 5, 1898.
  651,610. Machine for Covering Wires or Cables With Loose Fibers Suitable for Insulation. Franklin S. Randall, Wilkes-Barre, Pa., assignor of cne-half to William G. Harding, same place. Filed Jan. 10, 1900.

# TELEPHONES AND TELEPHONE APPARATUS.

651,540. Automatic Telephone-Switch. Robert T. Watt, Laurel Springs, N. J. Filed April 12, 1900.

# MISCELLANEOUS.

- MISCELLAN EOUS.
  651,342. Commutator-Truing Device. Edgar D. Carr, Akron, Ohio. Filed March 7, 1980.
  651,361. Electric Telegraphy. Isidor Kitsee. Philadelphia. Pa., assignor to Charles E. Wilson, same place. Filed May 20, 1899.
  651,362. Space Telegraphy. Isidor Kitsee. Philadelphia. Pa., assignor to Charles E. Wilson, same place. Filed May 20, 1899.
  651,363. Method of Transmitting Electric Impulses. Isidor Kitsee. Philadelphia. Pa., assignor to Charles E. Wilson, same place. Filed May 20, 1899.
  651,364. Compound Useful as Substitute for Rubber. Isidor Kitsee. Philadelphia. Pa. Filed June 26, 1899.
  651,471. Electrode for Secondary Butteries. Phul F. Ribbe, Charlottenburg, Germany. Filed Feb. 28, 1899.
  651,472. Electrical Appliance for the Cure of Deafness. William J. Tindall, New York City. Filed Feb. 8, 1899.
  651,476. Secondary or Storage Buttery. Owen T. Bugg. Jr., New York City, assignor to the United States Battery Company, same place. Filed Ju J. 1, 1899.
  651,483. Pipe or Conduit for Electrical Conductors. Edwin T. Greenfield, New York City. Filed Feb. 8, 1899.
  651,484. Junction Box for Electrical Conductors. Edwin T. Greenfield, New York City. Filed Feb. 8, 1899.
  651,484. Feeding Mechanism for Films in Kinematographs. Vilhelm Pacht, Copenhagen, Denmark. Filed Sept. 1, 1898.
  651,515. Casing for Graphophones. William T. Shields,

- 651,494. Feeding Mechanism for Films in Kinematographs. Vilhelm Pacht, Copenhagen, Denmark. Filed Sept. 1, 1898.
  651,515. Casing for Graphophones. William T. Shields, Altoona, Pa. Filed March 22, 1900.
  654,525. Receptical for Phonograph Records. John W. Collins, Washington, D. C. Filed March 20, 1900.
  651,545. Telegraphic Transmitting Apparatus. John Gardner, Knott End, Eng. Filed April 2, 1900.
  651,630. Phonograph-Record Carton or Receptical. Farnest U. Kinsey, Englewood. N. J., assignor to himself, and John R. Schermerhorn. Crange. N. J. Filed Jan. 11, 1900.
  651,664. System of Electrical Distribution. Albert S. Hubbard, Belleville, N. J., assignor to the Gould Storage Battery Company. New York City. Filed April 9, 1900.
  651,672. Electric Elevator. Alonzo B. See, New York City, assignor to himself and Walter L. Tyler, same place. Filed Nov. 3, 1899.
  651,696. Electric-Battery Attachment. Henry B. Ware, and Chauncey C. Cornell, Wymore, Neb. Filed Nov. 23, 1899.
  651,697. Electric Current-Shunting Device. Edward R. Cliff. New York City, assignor of one half to Frederick W. Wise, same place. Filed Jan. 4, 1900.
  651,718. Method of Electrically Treating Ores of Nickel, etc. Henri Leleux, Paris. France. assignor to La Compagnie Electrometallurgique des Procedes Gin et Leleux, same place. Filed June 12, 1899.
  651,771. Electrical Measuring Instrument. Ernest C. Rimington, London, Eng. Filed Jan. 27, 1900.
  651,777. Electrotherapeutic Apparatus. Fred H. Brown, Chicago, Ill., Filed Nov. 19, 1898. Renewed May 14, 1900,

# GENERAL NEWS.

## What is Going On in the Electrical World.

#### LIGHTING.

Canon City, Col.—This city will have another electric light company. C. C. Conkle will be at the head of the concern.

Coffeyville, Kan.—The city council recently adopted a resolution in favor of circulating petitions calling a special election to vote \$20,000 in bonds to be used in putting in an electric light plant to be owned and operated by the city.

Concord, Mass.—It was recently voted by the citizens to appropriate \$16,000 for an electric light plant.

Eiroy, Wis.-An electric light plant will soon be put in at the roundhouse.

Goldsboro, N. C.-The Goldsboro Illuminating & Traction Company has applied for a charter and will build an electric light plant. Address A. H. Edgerton, secretary.

Grand Island, Neb.—The city council has decided to put in an electric light plant.

Lime Spring, Is — Electric lights are now assured for this place. Mr. S.fford will furnish the power from his mill on the upper Iowa River.

Lyons, Mich.—W. R Coates of Kalamazoo, has pre-pared plans and estimates for improving the municipal

mancos, Col.—This town has empowered its board of trustees to construct and operate an electric light plant for supplying the town and its irhabitants. G. Bauer, mayor.

Manistique, Mich. - H. Rose will install an electric light plant in his own store building.

Milan, Mich.—The village council has voted to light the streets by electricity. W. P. Lamkin has received the contract a d expects to have the lights in operation by Ostober 1.

Montgomery, Ala -Alderman Ruth has introduced a resolution into the council to erect a municipal electric light plant.

New Washington, O.-A. P. Miller is circulating a petition to secure an electric light plant for this plant

New Wilmington, Pa.—A new brick and iron electric lighting plant is to be built here under the supervision of J. G. Martin, secretary, who has the plans.

Niagara, Falls, N. Y.—The owners of the Niagara Falls Gas & Electric Lighting plant contemplate the erection of a new addition to it that will cost over \$50,000.

North Platte, Neb. — At a recent council meeting an ordinance was introduced for the construction and operation of a new electric lighting plant for the city. It is expected that W. M. Cunningham, president of the local water works company, will be chosen as the head of the new concern.

Paul's Valley, I. T. - An electric light plant is to be erected here.

Richmond, Ind.—The city council is preparing to erect a municipal electric lighting plant.

River Falls, Wis.—This city has voted bonds to the extent of \$8,000 for an electric lighting plant to be operated by water power. The cost of the plant will be about \$17,000.

South Bound Brook, N. J.-There is some talk of

having electric lights here in place of the oil lamps.

South Portland, Me.—The council has lately granted a franchise to the Consolidated Electric Light Company.

Talladega, Ala.—A. G. Story, chairman of the electric light committee at this place, desires correspondence relative to the establishment of a complete electric

Thorntown, Ind.—The board of trustees has decided to put in an electric light plant to be owned by the

Toledo. Ill. - A system of electric lighting is soon to be installed here.

Valdosta, Ga.—The Valdosta Electric Light & Power Company will expend about \$23,000 in improving and equipping its plant.

Williamston, S. C.—The Williamston ()il & Fertilizer Company is in the market for a complete electric light outfit.

Wolfe City, Tex.—A proposition to establish a system of electric lighting is under consideration here.

## STREET RAILWAYS.

Conneaut, O.-The Pennsylvania & Ohio Street Railroad Company will build an electric line from here to Ashtabula. B W. Baldwin, treasurer.

Eastport, Me. — The conditions for an electric street railway at this place are favorable.

Fond du Lac, Wis.—The Wisconsin Revid Transit Company was recently incorporated with \$25,000 capital stock by H. G. Smith, C. D. Smith and R. S. Wilkins. The company contemplates the construction and operation of an electric line,

Lewes, Del.—It is likely that a trolley line will be built from here to Rehoboth soon.

Lorain, O.—Another electric line is seeking entrance into this city from the west. Thos. Wood of Sandusky is interested in the scheme.

Miamisburg, O — There will be an electric line built from here to Germantown. Capitalists of both cities are the promoters. The road is now being surveyed.

Orlahoma City, Okla.—The Oklahoma Land & Electric Street Railway Company was recently organized in this city and capitalized at \$200,000 by Judge J. M. Lindsay of Gainesville, Tex. The company will erect an electric light plant and construct an electric street railway as soon as a franchise is granted by the city.

Russell, Mass.—The question of an electric line from this place to Blandford is being discussed again.

Springfield, Ill.—The Illinois and Rock River Railway Company was incorporated here a short time ago with a capital of \$1,000,000. The purpose of the company is to build a line of electric railway which will gridiron the northern portion of this State. Chicago capital is back of the enterprise, those interested being Ephraim Banning, Thomas Banning, T. C. MacMillan, A. F. Milliken and G. E. Plumb.

Terre Haute, Ind. — Preliminary surveys are being made for an electric line between this city and Morcm. Valdosta, Ga.—T. G. Crawford and B. W. Bentley are interested in the proposed electric line here and will soon make arrangements to purchase the necessary

#### MANUFACTURING.

rails and other equipment.

Charleston, W. Va.—A. F. Doddridge, M. M. Murry, R. E. Richardson, S. B. Cheever, L. R. Curry, all of Chicago, Ill., have lately organized a company here known as the Electric Security & Signal Company, to manufacture and deal in electrical appliances, on a capital of \$1.000, 00.

Chicago, III.—The Meridan Hydro-Carbon Arc Light Company of this city will manufacture electrical goods and appliances on a capital of \$25,000. The incorporators are F. A. Cody, R. bert D. Cody and S. muel Foster.

Clarksburg, W. Va.—The Pittsburg, Pa., Glass Company recently purchased eight acres of land here. This territory will be the site for a factory for the manufacturing of electric light globes.

Portland, Me. — The Van Electric Manufacturing Company was organized here a short time ago for the purpose of manufacturing and dealing in electrical supplies, with \$600,000 capital stock. The officers are: Precident, 8 F. Van Choste of Boston; treasurer, W. E. Sanford of Attleboro.

Syracuse, N. Y. — The Syracuse Arc Lamp Company was lately organized here. The lamp will be manufactured at the works of the International Heater Company in South Clinton street. The men at the head of the concern are Beardley N. Sperry and Liuis W.

## COMPANY MATTERS.

Diyton, O—A short time ago the Dayton & Troy Electric Railway Company elected the following directors: Charles B. Clegg, president of the Oakwood Street Railway Company; D. B. Corwin, president of the City Railway Company; Valentine Winters, president of the Dayton & Western Traction Company; J. M. Wilson and Harry P. Clegg.

Philadalphia P. The Wilmington and Paradania.

Philadelphia, Pa.—The Wilmington and Brandywine Springs Electric Bailway Company has elected as efficers: President, Robert C. Justis; vice president, Dr. L. H. Ball; treasurer, Thomas F. Barry, of this city; secretary, H. F. Dure, Jr; general manager, Richard W. Crook.

# POWER AND TRANSMISSION PLANTS.

Springfield, Mass —Lieut.-Col. F H. Ph.pps has been considering for some time the advisability of running the Hill shops at the armory by electricity. Enough water-power can be used at the water shops to generate the amount of electricity which would be required for

## MINES.

Baker City, Ore.—The Barnt River Gold Mining and D eiging Company is to build an electric plant to cost \$75,000. The plant will be 600 horse power, with full espacity for operating all of the mills, the hoists, and completely lighting the tunnels and shafts of the mine.

# AUTOMOBILES.

New Haven, Conn.—Negotiations are said to be well under way for the purchase of the New Haven Carriage Company and the Columbia Automobile Company of Hartford by the Electric Vehicle Company of New York

New York.—It is reported that a new corporation is to be formed with a capital of \$3,000,000 to take over the property of the General Electric Automobile Comy of Philadelphia.

washington, D.C.—The Metropolitan Railroad Company has added to its equipment a model modern wrecking wagon in the shape of an automobile, which was manufactured by the Riker Electric Company. It is fully equit ped for rapid running, as well as with the implements and appliances to repair damages to rear or reads. cars or roads.



# THE TELEPHONE WORLD.

# Directors of the Erie Telegraph and Telephone Company.

At the annual meeting of the Eric Telegraph and Telephone Company in New York City on June 12, a board of 24 directors was elected, which includes 11 who are directors of the Telephone, Telegraph & Cable Company of America, the rival of the I'ell Telephone Company.

These members were elected several weeks ago, at the time

These members were elected several weeks ago, at the time a controlling interest in the stock was picked up in the interest of the Telephone. Telegraph & Cable Company, while the leading Bell interests were apparently asleep, and most of the men were simply re-elected.

of the men were simply re-elected.

The so called "independent" men are: George Crocker,
Frank A. Cutting, Harrison W. Gawtry, William H. Gelshennen, William J. Latta, Martin Maloney, Charles W.
Morse, Daniel O'Day, Frank Tilford and Henry R. Wilson.

The other members, most of whom were re-elected, are Albert B. Chandler, Frank A. Cutting, Frederick A. Farrar, Wesley A. Gove, David S. Greenough and C. S. Tuckerman, of Boston; C. E. Adams, John C. Burke, C. J. Glidden, James H. Mills, James W. C. Pickering, Asa C Russell and Levi Sprague, of Lowell, Mass.; Harvey A. Whiting of Wilton, N. H.

The board of directors organized as follows: President, Charles J. Glidden, of Lowell, Mass.; vice presidents Charles E. Adams of Lowell, Mass., James P. McKinstry of Cleveland O., Heman J. Pettengill of Boston, Mass.; secretary, George B. Perham, of Lowell, Mass.; treasurer, Charles A. Grant, of Lowell, Mass; executive committee, William J. Latta, Martin Maloney, Frederick A. Farrar, Charles S. Tuckerman, Charles J. Glidden and Charles E. Adams.

This company was originally organized as a Bell concern, and it absorbed various Bell companies which had the exclusive right to use Bell instruments in certain territory. The Bell Company bound itself not to organize other companies in the territory in question.

For a long time the Bell Company is said to have retained

For a long time the Bell Company is said to have retained a majority of the stock of the Erie Company, but finally it was satisfied to let a portion of its holdings go.

The promoters of the opposition company—the Telephone, Telegraph & Cable Company—were quick to see their opportunity, and William J. Latta secured a majority of the Erie stock for the backers of the Telephone, Telegraph & Cable Company. His company now dictates the policy of the Erie although the Bell Company is allowed to retain the pres dency of the company.

The Erie will be an important feeder of the general lines that are brought together by the Telephone. Telegraph & Cable Company. The Bell Company itself is precluded from establishing a rival system in Erie territory, which embraces Michigan, Wisconsin Minnesota, Arkansas, Texas, Cuyahoga County, including Cleveland, O., and some other territory.

The recent success of the independent telelephone companies in obtaining charters at Tonawanda, North Tonawanda, Niagara Falls, Lockport and other towns in New York State, has increased the enthusiasm of the friends of the Buffalo Telephone Company, the projected rival of the Bell monopoly in that city Every day adds a long list of names to the list of subscribers. Said one of the directors recently: "We find that all classes of business men are heartily tired of the exorbitant rates and poor service of the present telephone company. Physicians and druggists are especially weary of the thraldom, and are of great assistance to us in our work of procuring names. Just to cite an instance, a member of an association of fifty members informed me the other day that every one of the fifty had been pledged to subscribe to the new company. We have not been paying any attention to the matter of a franchise lately. When the proper time comes we shall have the proper thing to say on the subject." It will take only six months to complete the plant and begin operations, from the time the work of construction has been commenced. It may be reasonably expected, therefore, that the people of Buffalo will be liberated from high telephone rates and poor service early in the coming year.

The New York & New Jersey Telephone Company offers to pay the city of Elizabeth, N. J., \$75 a mile for the use of streets in which to lay a conduit for its wires. The company also agrees to furnish the city with twenty-five free telephones for its official business, and to give telephone service free to the police department to all points within a radius of twenty miles of Elizabeth. The company asks for the franchise for a term of fifty years,

The annual meeting of the Nicollet County Telephone Company of Minnesota, was recently held at St. Peter, Minn., when the following officers were elected: President, C. C. Nelson; vice-president, M. C. Quist; secretary, A. L. Strauch; corresponding secretary, H. A. Burke; treasurer, Aug. Olson, directors, J. A. Poetz, H. J. Essler, A. L. Strauch, Aug. Olson, Joseph Wild, G. M. Cesander, H. A. Burke, M. C. Quist.

# An Independent Long Distance Service for Chicago.

Chicago will have an independent long-distance telephone connection with St. Louis as soon as the exchange of the Illinois Telephone Company is established in Chicago. This announcement was made recently in a positive manner by Dr. I. A. Lumpkin, president of the Illinois State Telephone Association.

In spite of the denials of President Wheeler of the Illinois Telephone Company that his company has any connection with the independent movement, Dr. Lumpkin says that the Illinois Company is as anxious as are the companies in the Illinois Association that the long-distance connections be made and all the independent companies in the State be united in competition with the Bell Telephone Company.

According to those best informed in telephone matters, there is no truth in the stories published recently to the effect that the franchise of the Illinois Telephone Company is for sale. The company is continuing the work of putting in the conduits to carry wires under the streets, and it is said that the title to its ownership is expressed in a single stock certificate deposited with a Chicago trust company. The capital for the construction was furnished by a St. Louis syndicate, with the agreement that no holdings could be sold until all were sold, which insures the completion of the system and the establishment of a rival to the Bell Telephone Company in the local field. It is said that the owners of the Illinois Telephone Company franchise are also the promoters of the Kiuloch Telephone Company of St. Louis, which is to furnish the St. Louis connections for the independent companies.

#### The Kentucky Telephone Association.

The Kentucky Telephone Association met in Winchester, Ky., recently. Fifteen independent companies were represented, comprising those of Central Kentucky and some from other parts of the State. The following officers were elected: David Prewitt of Pine Grove, president; A. H. Bastin of Crab Orchard, vice-president: W. W. Longmoor of Frankfort, treasurer; James Maret of Mt. Vernon, secretary; D. L. Pendleton, of Winchester, attorney; R. V. Bishop of Cynthiana, D. S. Baldwin of Richmond, and D. L. Pendleton of Winchester, executive committee.

Arrangements were made to connect the central and northern counties in the State by metallic circuits, and this work will be carried out this year. The lines of the independent companies will be pushed toward Louisville, Cincinnati, Knoxville and other large cities on or near the borders of the State. Uniform toll rates and metallic circuits on all lines will be insisted on, and a mutual interchange of business will be made, while the companies will still retain their present status of independence.

At the meeting of the Independent Telephone Association of Wisconsin, held recently at Madison, a resolution was passed that no member of the association shall sell an independent line to the Bell Company without first offering it to the association, or a member of the association. The matter of a combined trunk long-distance system was left in the hands of the executive committee to investigate and report. Six new companies were taken into membership, making a total of twenty five independent systems in the association, representing six-tenths of the independent telephone interests in the State of Wisconsin. The new companies are the Viroqua, Beloit, Eastern Wisconsin, Poynette, Troy and Honey Creek and Edgerton. The next meeting will be held in Madison the second Wednesday in February.

The Haverhill, Mass., "Gazette" has this to say regarding the refusal of the authorities of Lynn to allow the People's Telephone Company to do business in that city: "The refusal of the Lynn aldermen to allow the People's Telephone Company to do business in that city seems to savor of petty politics, and it will give rise to much unpleasant comment. The privilege to 'live and let live' does not seem to prevail in the city hall circles of our sister shoe city. It was poor politics to condemn the company wholesale until it had been given a fair trial, and it was ascertained if it merited such treatment."

The council of Junction City, Kan., has granted a franchise for the building of an independent telephone exchange. This means that Junction City is to be another link in the chain of independent exchanges that reaches out in every direction and covers nearly every town of importance in the State of Kansas. As an example of the extent of the independent telephone movement in that territory the three cities of Abilene, Manhattan and Salina have over 1,000 independent 'phones, and only 124 Bell instruments.

At a recent meeting of the stockholders of the Southwestern Telegraph & Telephone Company it was decided to increase the capital stock from \$7,000,000 to \$10,000,000,

# Telephone Wires Span the Connecticut River.

One of the picturesque mechanical features of the new series of long distance telephone wires from New York to Boston is the aerial span across the Connecticut River just north of Middletown. On account of the length of the metallic circuit it was necessary to avoid using a submarine cable for the reason that with a cable the efficiency of the circuit would be greatly impaired by reason of the capacity and induction in the insulating and protective devices, and also in the cable itself. "The Municipal and Railway Record" gives this description of the span: "The span is supported by two towers of structural steel at a distance of 1,300 feet apart, and carries now twenty wires, No. 8, B. W. G., which has a tensile strength of 82,000 pounds per square inch. It was necessary to string all these wires at equal ten sion to svoid crossing in windy weather. To obtain this equal tension each wire is fastened to an iron bolt about 20 inches long. This bolt is provided with a strain insulator at one end, a tightening nut at the other. Because phono-electric wire does not stretch to appreciable extent this enables the spans to be drawn to the desired tension. The towers vary in height, one being 182 feet high and standing in a clearing, and the other 82 feet high, standing on a bluff."

The independent telephone movement in Greater New York, represented by the Knickerbocker Telephone & Telegraph Company, is making rapid progress, although its wires are not yet in use. The new company has some 5,700 subscribers, and new names are being added at the rate of forty a day. One hundred and fifty working wires have been laid in the subway from the down town district to 23d street, 400 wires from 23d street to 135th street, and twenty wires from 135th street to the city line. The pole line work has just been completed from Long Island City through Jamaica and Flushing to Far Rockaway.

Some of the business men of Nacogdoches, Texas, have organized a telephone company for the purpose of building a line from that city to Beaumont on the Texas & New Orleans Railroad extension, and from Nacogdoches to Houston on the Houston East & West Texas Railroad. The right of way has been secured and the company will shortly begin stringing wires on the Beaumont line. A sufficient force of men will be employed on construction to reach Beaumont by the middle of July. The line to Houston will be in operation a month later.

Mayor Hayes of Baltimore, Md., has instructed Chief Engineer Phelps, of the Municipal Subway Commission, to have a municipal telephone exchange installed in the city hall of that city as soon as possible. The Maryland Telephone Company agrees to establish the exchange and maintain it for one year on trial. The intention is to dispense with as many Chesapeake and Potomac telephones as possible.

The Southern New England Telephone directors have voted to increase the capital stock of the corporation from \$2,500,000 to \$2,750,000. The proceeds of this amount are to be used to pay off the floating debt incurred for enlargement of the company's plant in various parts of Connecticut.

# TELEPHONE INCORPORATIONS.

The Shawnee Telephone Company, Stone Bluffs, Ind. Capital stock. \$3,000,

The Kinloch Long Distance Telephone Company, St. Louis, Mo.—to construct and operate telephone lines. Capital stock, \$300,000. Incorporators: A. Busch. W D. Orthwein, P. Stock, W. F. Nolker, A. Gehner, S. M. Kennard, all of St. Louis.

The Petroleum Telephone Company, Charleston, W. Va, Capital stock, \$1,000,000. Incorporators: J. H. High, C. G. High, G. O. Chilton, J. F. Noyes, F. L. McGee, all of Charleston.

The Clark Automatic Telephone Switchboard Company, Providence, R. 1—to manufacture automatic switchboards. Capital stock, \$1,000,000. Incorporators: E. M. Prindle, J. W. Phillips, F. W. Reed, S. W. Tabor, F. A. Seib, all of Providence, R. I.

The Plainfield Telephone Company, Jersey City, N. J.-to operate telephone lines Capital stock, \$15,000. Incorporators: A. Dingler, R. J. Emory, both of Jersey City; H. F. Atkinson, of Red Bank.

The Greenwood & Canisteo Telephone Company of Steuben County, N. Y.—to connect by wire Greenwood and Canisteo, and surrounding territory. Capital stock, \$8,000. Incorporators: A. P. Woodward, N. E. Coston, J. M. Atkins, J. 8. Tobias, Greenwood; Frank Failing, Rexville,



# ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers a. compiled from special reports received by Electrical Securities dealt in at the leading commercial centers a. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem is a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; cell., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gcn., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

# STOCKS.

PASSE	NG	ER R	AILW	AYS.			PASSE	NG	ER R	AILW	AYS.		
	Capital Stock.			Rate and Date of					Capital Stock.		Bate and Date of		
WANE.	Par	Authorz'd	Issued.	Last Div.	Bld.	Asked.	NAME.	Par	Authorz'd Issued.		Last Div.	Bid.	Asked
Albany, N Y June 18 United Traction	100	\$5,000 <b>,0</b> 00	\$5 000 000	1½ % Q.,	124	125	Hartford Conn June 18: Hartford Street Ry. Co Hartford & West Hartford RR Holyoke MassJune 18.		\$4,000,000 1,000,000		8 % S., Oct.,	150	=
Troy City Railway.)							Holyoke Street By, Co	100	600,000	400,000	8 % A., June,	2073	212
Allentown Pa June 18 Allentown & Lebigh Val. Trac. Oo.		4,000,000	1.500.000			15	Hoboken, N. JJune 18. North Hudson Co. (N. J.) Ry. Co	25	1,250,000	1,000,000	8 %.	150	_
Bridgeport, Conn-June 18:	100	2,000,000		1 % Aug.,	105		Indianapolis, Ind-June 18.  Indianapolis Street Ry		5,000,000	5,000,000		24	245
Baltimore Md - June 18 a United Rail ways & Elec. Cocom.	50	24,000,000	18,000,000		23	281/2			10,000,000	9,900,000 87,500			-
Boston, Mass.—June 18 Now England Street Ry. North Shore Traction Co	100 50 50	4,000,000 2,000,000 10,000,000	4,000,000 2,000,000 9,085,000 6,400,000	1 % Q., Jan.15, 5 % S., A. & O. 3% % S., Oct., '59. 4 % S., Jan. 2½ % Aug. 99,	15 85 93 112 139	16 87 94 114 140	Lancaster & Col. Electric Ry	100	4,000,000	8,500,000 2,500,000	1½ %., April. 2½ % S., Oct. 1,	78 110	79 111 685
Brooklyn N. Y June 18 Brooklyn City Ry	100	43,000,000	1,928,400 48,000,000 200,000 12,000,000	************	229 665/107 257	280 65 <sup>3</sup> / <sub>4</sub> 109 289	Twin City Rapid Transitcom Twin City Rapid Transit7% ptd. Montreal, Canada.—June 18 Montreal Street Ry. Co	50	4,000,000	1,712,200	13/4 %, Oct, 8 % S., M. & N. 13/4 % S., J. & J.	260 + 10034	187
*dBrooklyn City RR		4,750,000	2,000,000 1,884,200 4,750,000	2 % % Nov., 99	320	825	Memphis Tenn.—June 18: Memphis Street Railway Co			500,000		25	1
Kings County Traction Co	50	6,000,000	6,000,000		75	80	New Haven, Conn.—June 18. Fair Haven & Westville RR New Haven Street Railway Oo New Haven & Centerville.	25 100	1,250,000	2,000,000 1,000,000 800,000	8 % S., Fept. 2½ % A., July	89	41
Buffalo N. Y.— June 18: Buffalo & Niagara Falls Elec. Ry *Buffalo Railway Co	100			1 % Q. Dec., 99	74 99	75 100	New Orleans, LaJune 18	25	1,000,000	600,000	**********	15	46
Columbus OJune 18: Columbus Street Railroad Columbus Street Bailroad, pfd	100			1 % Q., Feb.	25 88	28 88	Canal & Olaiborne RR. Co	100 100 100	1,200,000	************	4 % S., July, 1% % Q., Oct.	1485 22> 95	153 24 96
Charleston, S. C June 18 Charleston City Ry. Co	50 25	100,000		8 % 8.	::	::	aCrescent City RRguar. bNew Or. City & Lake RRguar. Orleans Railroad St. Charles Street Railway	100 100 50	2,000,000 500,000	2,000,000 2,000,000 185,000 1,000,000	8 % S., Jan., 4 % S., Jan., 1½ %., June, 1¼ %. Oct.,	56%	26 52 57
Chicago, Ill.—June 18 Chicago City Ry. Co Chicago & South Side R. T. RR. Lake Street Elevated RR. Metropolitan West Side Elev. Ry Mot. West Side El., pfd North Chicago Street RR. hNorth Chicago City RR. South Chicago City RR. West Chicago City Rallway West Chicago St. RR. Co Union Traction Copref.	100 100 100 100 100 100 100	10,828,800 10,000,000 15,000,000 15,000,000 10,000,000 500,000 2,000,000 20,000,000 1,250,000	10,828,800 10,000,000 7,000,000 9,000,000 6,600,000 249,900 1,608,200 18,189,000 624,900	Feb 28 1900. 8% Q., Jan. 11% % Q., Feb.	252 10 30 77 209 110 17 64	253 101/2 31/2 78 210  18 67/2	New YOPK—June 18: Central Crosstown RR. cChristopher & 10th Sts. RR. guar Dry Dock, E. Brdw'y & Battery RR dMetropolitan Street Ry. Co. «Eleecker St. & Fulton Fy. Ry. guar fBroadway & Seventh Ave guar gCen. Park, N. &E. Rivers RR. guar hEighth Avenue RR. i42d St. & Grand St. Ferry RR. guar jNinth Avenue RR guar kSixth Avenue RR guar	. 100 . 100 . 100 . 100 . 100 . 100 . 100 . 100	650,000 1,200,000 45,000,000 900,000 2,100,000 1,800,000 1,000,000 750,000 800,000 2,000,000	748,000 800,000 2,000,000	2½ % Q. 2 % Q., Oct., 1½ % Q., Nov. 2½ % Q., Feb., 1900 2½ % Q., 2½ % Q. 2½ % Q.	270 175 100 1/1 86 230 99 8-5 895 198	307 .84½ 125 151½ 37 240 201 410 205 210 415
Cincinnati, Ohio.—June 18: Cincinnati Inc. Plane Rycom. Cincinnati Inc. Plane Rypfd.	90		575,000	₩ Feb	::	::	Second Avenue RR. Third Avenue RR. m42d St., Manhatv'le & St.Nich.Av *Union (Huckl-berry) Ry.	100	2,500,000 12,000,000 2,500,000	1,862,000 10,000,000 2,500,000 2,000,000	2 % Q., Jan,, \$1.75 p. sh. Feb.	198 109 10 190	201 10 1/8 60 200
Cincinnati, Newport & Oov. St. Ry. IOincinnati Street Ry. Co	100	8,000,000	8,500,000 14,000,000 2,200,000	½ % Feb. 2½ % Feb. 1½ % Q., Jan. 1½ % Q., Jan.	75 124 %	121	Newark N. JJune 18: Consolidated Traction Co. of N. J North Jersey Street Railway Co.	100	15,000,000	15,000,000	***************************************	57	£9
Cleveland, Ohio.—June 18; Agron, Bed. & Clev. Elec. By Oleveland City By Cleveland Electric By	100	8.000.000	1,000,000	34 % Jan. 3-5 % Jan. 3-6 % Q., Oct., '99.	48 100 87	50 101 87%	United Electric Co. of New Jersey Pittsburg, Pa.—June 18: Allegheny Fraction Co	100	504,000		11% % A.	27½, 28×	28 24 <sup>1</sup> / <sub>2</sub> 56
Detroit, Mich.—June 18 Detroit Citizens' Street Ry. Ft. Wayne & Belle Isle Ry. Rapid Railway Co Detroit Electric Railway Wyandotte & Detroit River Ry	100	2,000,000 250,000 1,000,000	1,250,000 1,200,000 250,000 1,000,000		100½ 175 90	i00 i10	Consolidated Traction Copfd. pCentral Traction Co qCitizens' Traction Co rDuquesne Traction Co sPittsburg Traction Co feed ral St. & Pleasant Valley Dy.	50 50 50 50	9,478,850 1,500,000 8,000,000	9,000,000  900,000  8.000,000	8 %, Nov. 1½ % Nov. 6 % A.	25 63% 69 12% 	70 721/2
Dayton OJune 18:  Oity Railway Co	100	1,500,000	1,470,600 600,000		140 170 114	145	Pgh., Allegheny & Man. Trac. Co P'tisourg & Birmingham Trac. Ry Pitisburg & West End Ry. United Traction Cocom United Traction Copref.	50 25 50	28,000,000 17,000,000	8,000,000 17,000 000	5 % A., June	41 -4 51 <sup>3</sup> / <sub>8</sub>	1434

\*Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consol dated Railways & Deterric Company comprises in its organization the Baltimore Consol dated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by the secompanies, and also the Central Railway Co of Baltimore The preference of U.R. & E.e. Co. haben issued in the form of moome bonds. b Leased to B ston Everated Railway Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Krosklyn Rapid Transit Company; road operated by Brooklyn Heights Railroad Co., which guarantees to Nassau Electric RR g Owned by Krosk County Traction Company; road eased to Nassau Electric RR g Owned by Kings County Traction Company; road eased to Nassau Electric RR g Owned by Atlantic Ave RR and leased to Nassau system.

h \$30 per share on outstanding capital paid as rental by lessee — West Chicago St. RR. Co. \$250,100 of stock owned by North Chicago Street Railroad Company.

d Ontrois by lesse Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Company; \$625,100 of stock owned by West Chicago Street Railroad Company; \$% on \$1,000,000 stock guaranted by West Chicago Street Railway Company; 5% on \$1,000,000 stock guaranted by West Chicago Street Railway Company; 1886,000 pany, lessee.

Cineinnati St. Railway purehased the Mt. A. & Eden Park road, assuming the bonds.

\*Unlisted. † Full paid. [Outstanding. ‡ Ex-div.
a Leased to New Orleans Traction Company at 6 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock and interest on bonds.
c Leased to Central Orosstown Railroad at 8 % on stock and interest on bonds.
d Operating the former Med. Trac. system, that corporation having become extinct.
c Leased to 23d Street Ry. for 99 years; lease assigned to Met opolitan Street Ry.
f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Ry.
f Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.
i Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.
i Leased to Metropolitan Street Railway for 18 % on stock
i Leased to Metropolitan Street Railway for 18 % on capital stock.
m Controlled by Third Avenue Railway for 18 % on capital stock.
m Dividends of 1% % yearly guaranteed by Consolidated Traction Company.
o Controls by lease the Alleg'ny, Cent., Citizens' Duqueene, Fort Pitt & Pitth Traction.
p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
r Leased to Consolidated Traction Company for 8 % on espital stock.
s Leased to Consolidated Traction Company for 4 % on espital stock.
s Leased to Consolidated Traction Company for 4 % on espital stock.

īx

2 % Sept 1,'99.

1,250,000 1% % Feb

1,000,000 2,500,000

#### PASSENGER RAILWAYS.

# TELEPHONE AND TELEGRAPH COS.

NAME.		Capital Stock.		Bate and Date of		l	_	L	Capital Stock.		Bate and Date of		1
		Authors'd	Lasued.	Last Div.	E3d.	Asked.	NAME.	Par	Authors'd	Issued.	Last Div.	Bid	. Asb
New Becford Mass-June 18 Union Street Rallway Co	100	\$850,000	\$850,000	2 %, Feb.	160	165	Boston, Mass June 18 American Bell Telephone Co Eric Telegraph & Telephone Co	100			1% % Q., Jan. 1 % Q., Feb 20,	804	8°5
Northampton, Mass-June 18 Northampton Street Bv		800,000	225,000	4 % A., June.	179	178	New York.—June 18	-	10,894,600	10,834,600	\$1.50 p. sh. Feb	120	181
maha, NebJune 18:	100	5,000,000	5,000,000	8 % A. and N.	55	65	American Telegraph & Cable Co *Central & South Am. Teleg. Co	100		6,500,000	1 1 X Q.	91 104	91
aterson, N. J June 18	100	1,250,000	1,250,000	***************************************	54	-	Franklin Teleg. Co2½ % guar. Erie Telegraph & Telephone Co	100 100	1,000,000 5,000,000	4,800,000	1% % 8.	165 42 112	170 5:
FOVIDENCE, R. I.—June 18: nited Traction & Electric Co	100	8,000.000	8,000,000	% %, Oct. '98	109	111	*Gold & Stock Telg. Coguar. 6 %.  *International Ocean Tel Co.guar 6 %  Mexican Telephone Co	100 100	8,000,000 2,000,000		1% % Q.	116	28 114 21,
hiladelphia.—June 18 airmount Park Traus. Co850 pd.	50 50	2,000,000	1,770,000	2 %, Dec. '59.	28 47	24 48	*New York & New Jersey Tel. Co *Pacific & Atlantic Telegguar. 4 % *Postal Telegraph Cable Co	25 100	2,000,000 15,000,000	15.000.000	2% % Q., Jan., '99. 2 % S. 1 % Q.	163	174 55
estonville, Man. & Fairmount est'nvl'e, Man. & Fairm't6 % pfd. aFairmount Pk. & Had. Pass. By.	50 50	800,000	800,000	2½ %, July 15, '\$9. 3 % 8—July, '99. 8 % Feb. 1, '\$9.	75 76 35	76 76 8 1/4	*Sout'n & Atlantic Telg. Co.guar.5 % †Commercial Union Telegraph Co Western Union Telegraph Co			559,525 500,000 97,870,000	2% % 8. 8 % 8., Jan., '99 1% %, Q, Jan 99	95 115 80	00
nion Traction Co \$12½ pd Electric Traction Co	50 50	500,000	8,297,920 †192,500	\$8 share Q.	845	***	Miscellaneous June 18:						
eFrankford & Southwark Pas. B (Lehigh Avenue Ry. Co (Lombard & South Street Ry	25	1,000,000	1,000,000	814 sha'e A—Apr. \$9 A. & O.	90	451 903	American Dist. Teleg. (Phila.) Bell Teleph. Co. (of Canada.) Chesapeake & Potomac Telep. Co	25 100 100	400,000 8,960,000	8,561,000		26 188 61	87 (6
dSecond & Phird Streets Ry  Prople's Traction Co  gGermantown Passenger Ry	50 50 50	10,000,000	16,000,000	89 share A, Mar. 98 8 %, A., April, '98. 85.25 share—1898.	150	151	Chicago Telephone Co	100 100	750,006	750,000	••••	200 148 79	210 150 80
pGreen & Coates Passenger Ry. hPeople's Passenger Rycom. hPeople's Passenger Rypfd.	20	500,000	150,000 710,000	8 % Jan., 1898.	151	152	Hudson River Telephone Co *Northwestern Telegraph Coguar	100 50	2,000,000 2,500,000	2,000,000 2,500,000		120 122	125 125
(Philadelphia Traction Co	50 50 50	30,000,000	1400,000	\$2 p. sh., Oct. 98. 6 % A—Mar., '98. \$6 share—July, '98.	96	96¼ 157	Providence (R. I.) Teleph. Co Southern New Eng. Teleph. Co	100			····		95 
Continental Pass. Ryguar Empire Passenger Ry. Co Philadelphia City Pass. Ry	50 50	600,000 1,000,000	1600,000 1475,000	7.50 share July'98	208	2081/4	Boston. MassJune 18:	1/0/	DELE	ECIRI	CAL MFG	. <u>C</u>	
Ridge Avenue Passenger Ry	50 50 50	750,000	200,000 (	83.50 share July '98. 312 share, July '98. 32 share July, '98.	3.8%	••	Fort Wayne Electric trust receipts Ft. Wayne Elec Co. T. Sec. Series A.	25				115 86	125 48
17th & 19th Sts. Pass. Ry. guar Thirteenth & 15th Sts. Pass. Ry. Union Passenger Ry. Co	50 50 50	1,500,000	[900,000]	1½, % S., July, '98. 311 sh. A., July, '98. 39.50 shre, July '98	289	240	tGeneral Electric Co. [old] com. General Electric Co. [new] " TH. Elec. CoT. Secur., Series D.	100		18,276,000	2 % Q., Aug., 1898 1%% Q., Jan., 1900	77	130
iWest Philadelphia Pass. Bv uchester, N. YJune 18	50	750,000	750,000	310 share, July '98	262	1 1	Westinghouse Elec. & Mfg.Co.com. Westinghouse El. & Mfg. Co. pfd. Westinghouse El. & Mfg. Co. assent.	50 50 50	4,000,000 11,000,000	146,700 8,936,058 8,195,126	% % Q., Jan.,	48 62 44	45 623 443
eading, PaJune 18	100	5,000,000	5,000,000		16	17	New York.—June 18: Edison Elec. Ill'g Co., New York	100	9,188,000	7,988,000	•	119	120
Meaning Traction Co	50	1,000,000 850,000	850,000	Semi-an.,Jan. & Jy Jan., '98.	24 188 70	26 	*Edison Elec. Ill'g Co., Brooklyn Edison Ore Milling Co Electric Vehicle Cocom.	100 100	4,000,000	2,000,000	⅓ % Oct., '98. 	8 82	12 93
(East Reading Electric Ry	50		‡1, <b>000</b> ,000	Jan., '95.		1 1	General Electric Co. [new]	100 100 100	40,000,000 18,276,000 1,000,000	18,275,000 1	2 % Q., Aug., 1898 1% % Q., Jan., 1900.		1863
ourth Street & Arsenal Ey offerson Avenue Ry. Co	50 50 100	400,000 <b>2,5</b> 00,000	150,000 400,000 2,400,000	2 % Dec., 1888. 1% % Jan., '99.	::			100		2,500,000	A. & O.	110	125
ational Railway Co Cass Avenue & Fair Grounds Citizens' RR	100	2,500,000 2,500,000 2,000,000	2,479,000   2,500,000   1,500,000	14 % Jan., '99. 14 % Jan. '99. 18. Oct '98.	:: ::	••		100 50	500,000 800,000	500,000 800,000	J. & J. Q	168	172
St. Louis RR	100 50 50	2,000,000 2,400,000 1,000,000	2,000,000 2,800,000 800,000	1 %, Oct., '98. 2 % %, Jan., '99. 1 % % Jan., '99. 50c., Dec., '89.	::	::	Philadelphia, Pa.—June 18 Edison Electric Light Co	100	2,000,000		******	144	144
nited Electric Ry	50 100	500,000 1,000,000	500.000	3 %, Jan., '99.	201⁄4 69 68	71	*Electric Storage Battery Copfd. Northern Elec. Light & Power Co	100 100 10	<b>8,500,000</b> <b>5,000,000</b> <b>550,000</b>	550,000	******	67 13	15 6× 18
nion Depot RRan Francisco, Cal.—June.	100		4,000,000	3 % A., July, '89.	:	•	Southern Elec. Light & Power Co  Miscellaneous.—June 18	10	187,500	187,500	•…	<b>3</b> 0	-
eary Street Park & Ocean RR	100 100	1.000.000	875 000	2 50 share. '96.	117 50	119	Bridgeport (Conn.) Elec. Lt. Co Missouri-Edison (St. Louis)com. Eddy Electric Mfg. Co	25 25	500,000		••••	47 20 10	48 21 14
esidio & Ferries RR SPANTON PA - June 18	100	1,000,000	550,000 550,000	2., 60c. per share.	611/2	68½ 16	Hartford (Conn.) Lt. & Power Co	100 25 100	850,000 175,000 100,000		••••	150 6 195	105
Scranton & Carbondale Trac. Co	50 100	500,000	500,000	*******************	29 16%	80	Narragansett (Prov., B.I.) Elec. Co.	50 100	1,200,000	2	% Q., Oct.,	98 1144 201	100 120 202
oringfield Ill.—June18:	100		1,050,000	*************	**	••	Toronto (Canada) Elec. Light Co Thomson-Houston Welding Co	100 100 100	1,085,000	1,085,000	34 % Q % S, Dec. 1, 96.	105	100 106
pringfield Consolidated By pringfield OJune 18	100	750,000	750,000	*********		••	†On Aug. 17 last by a majority vote to \$20,827,200, of which \$18,276,000 is ea	of omn	on and \$2.	551,200 pre	e capital stock was	s red I Ex	uced div
pringfield Street Rypringfield, Mass.—June 18	100	1,000,000	1,000,000	***************************************	-	11	Recently acquired the Edison Illupany, the Municipal Electric Light (	Co.				uent	ccn
ringfield Street Ry OFONTO CanadaJune 18:	100	1,200,000	1,166,700	3 <b>%∆.</b>	201	212	Boston MassJune 18:	<u> </u>	NDUS	STRIE	S.		
ontreal Street Railway Co	100	6,000,000 <b>4,</b> 000,000	6,000,000 1 4,000,000 1		100 260	100½ 261	American Electric Heating Co Street Ry. & Illu'g Propertiespfd	100			2 p. sh. Jan. 26, '90	=	-
Vashington, D. C. – June 18: bit Ry. Co	50 100	500,000 112,000,000	500,000	55c. per sh, Oct. \$9.	ומוג	105	•	100		1,000,000 \$	8.50 p.sh. Nov '99	-	:00
olumbia Ry. Co	50 50	400,000	400,000,6	3% Å.	85 15	40	New York.—June 18: Consolidated Electric Storage Co					8	12
otropolitan RR. Co	50		458,900	% <b>% Q</b> .		· •	Worthington Pump Cocom.	100 100 100	5,500,000	5,500,000 2,000,000 7			156
Worcester Traction Cocom. Worcester Traction Co6 % pfd.	100	8,000,000 2,000,000	8,000,000 2,000,000	% 8., Feb., '98.	81 1045	100	Philadelphia PaJune 18 Electro Pneumatic Trans. Co	10	1,500,000			İ	8
Vilkesbarre & Wyoming Val Tree			012,000	1% %, 1091.		~	United Gas Improvement Coscrip. Welsbach Commercial Cocom.	50 100	10,000,000 <b>8,5</b> 00,000		~~ ~~ YO	21.2 20 73	162 21
ilkesbarre & Wyoming Val. Trac  * Unlisted. † Paid in. ‡ Full	hlac	LOutete	nding 2	Fr.dir	26	29_	Welsbach Light Co	100 5 5	500,000 525,100 500,000		<b>X Q</b>	48 13	75 44 13/8
b Consolidation Electric, Peocharges and all indebtedness of c	:Fair nte'∎	rmount Pa	ssenger R	y. for 6 % on stock			OWI DOLUHGUM W.R. CO	100	200,000	200,000			
Traction Company. c Practically all shares owned I							Handard Underground Cable Co	190	1,000,000	1,000,000	9	90	92

b Consolidation Electric, reopers and charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.
d Lease to Frankford & Southwark Passenger Ry, assumed by Electric Traction Co.
s Leased to Electric Traction Company.
f Controlled by Frankford & Southwark Passenger Railway,
g Leased to Propie's Passenger Railway at \$5 per share.
h Majority of stock owned by People's Traction Company.
i Leased to Union Traction Company.
j Leased to Union Traction Company.
j Leased to United Traction Company at a revial of \$10,000 per annum in 1866-7-3
p.a. \$20,000 in 1809-1900 and \$30.0.0 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.
b Dividend of 10% guaranteed by Reading Traction Company.
Dividend of 6% guaranteed by Reading Traction Company.
Leased and operated by the Scranton Eallway Co., formarly Scranton Traction Co.

General Electric Co. [old]com.			IRD 460 MM	2 % Q., Aug., 1898		
General Electric Oo. [new] "	100		18 275 000	14 % Q., Jan., 1900.	120	1861/
Interior Conduit & Insulation Co	100	1,000,000			41	100/4
Kings Co. El. L. & P. Co	100		2,500,000		110	125
	100	2,000,000	2,000,000	1. 20.	1.10	
Pittsburg, PaJune 18					1	l
Allegheny County Light Co	100	500,000	500,000	J. & J.	168	100
East End Electric Light Co	50				100	172
mast mad biocetic mans co	- 50	800,000	800,000	Q	-	-
Philadelphia, PaJune 18					i	
						l
Edison Electric Light Co	100	2,000,000	*****	*****	144	1443
Electric Storage Battery Cocom.	100	8,500,000	• • • • • •	*****	15	15
Electric Storage Battery Copfd.	100	5,000,000	•• •••	******	67	64
Northern Elec. Light & Power Co	10	550,000	550,000	*****	13	185
Southern Elec. Light & Power Co	10	187,500	187,500	••••	80	_
Manallamanna Tuna 10		· .				
MiscellaneousJune 18						ĺ
Bridgeport (Conn.) Elec. Lt. Co	25	500,000			47	48
Missouri-Edison (St. Louis)com.				l	20	21
Eddy Electric Mig. Co	25			l	10	14
Hartford (Conn.) Elec. Light Co	100	850,000		!!!!	150	185
Hartford (Conn.) Lt. & Power Co	25	175,000			6	10
New Haven (Conn.) Elec. Lt. Co	100	100,000		1	195	
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	•••••	2 % Q., Oct.,	98	100
Bhode Island Elec. Protec. Co		1,200,000	•••••	2 76 42, 002,	1134	20
Royal Elec. Co. (Montreal)		1,000,000	•••••	1% Q 1	201	202
Foronto (Canada) Elec. Light Co		1,085,000	1,085,000		181	8.4
		1,000,000	1,000,000	173.79		
	100	1				
Thomson-Houston Welding Co		•••••	•••••	8 % 8, Dec. 1, 96.	108	100
Thomson-Houston Welding Co †On Aug. 17 last by a majority voi to \$20,827,200, of which \$18,276,000 is o	100 te of	the stock	holders 11 2,551,200 pt	he capital stock we referred.	105 s red 1 Ex	106 uced div.
Thomson-Houston Welding Co Woonsocket (R. I.) Electric Co †On Aug. 17 last by a majority vot to \$20,827,200, of which \$18,276,000 is of Recently acquired the Edison Illeany, the Municipal Electric Light	e of communic co.	the stock non and \$ nating Co.	holders ti 2,551,200 pt of Brook	he capital stock we referred. lyn and its consti	105 s red 1 Ex	106 uced div.
Thomson-Houston Welding Co	e of communic co.	the stock non and \$ nating Co.	holders ti 2,551,200 pt of Brook	he capital stock we referred. lyn and its consti	105 s red 1 Ex	106 uced div.
Thomson-Houston Welding Co Woonsocket (R. I.) Electric Co †On Aug. 17 last by a majority vot to \$20,827,200, of which \$18,276,000 is of Recently acquired the Edison Illeany, the Municipal Electric Light	e of communic co.	the stock non and \$ nating Co.	holders ti 2,551,200 pt of Brook	he capital stock we referred. lyn and its consti	105 s red 1 Ex	106 uced div.
Thomson-Houston Welding Co  Woonsocket (R. I.) Electric Co  On Aug. 17 last by a majority voles \$20,827,200, of which \$18,276,000 is a flecently acquired the Edison III pany, the Municipal Electric Light  ALLIE  BOSTON MASS.—June 18:	100 se of community Co.	the stock non and \$ nating Co.	holders ti 2,551,200 pt of Brook	he capital stock we referred. lyn and its consti	105 1 Ex tuent	106 uced div.
Thomson-Houston Welding Co	100 le of community Co.	the stock non and \$ nating Co.	holders til 2,551,200 pr of Brook	referred. lyn and its consti	105 t Ex tuent	106 uced div.
Thomson-Houston Welding Co	100 le of community Co.	the stock non and \$ nating Co.	holders til 2,551,200 pr of Brook STRIE	e capital stock wireferred. Iyn and its consti	106     as red   £x   tuent	106 uced div. ccm-
Thomson-Houston Welding Co	100 le of community Co.	the stock non and \$ nating Co.	holders til 2,551,200 pr of Brook STRIE	referred. lyn and its consti	105 t Ex tuent	106 uced div.
Thomson-Houston Welding Co  You Aug. 17 last by a majority vot to \$20,827,200, of which \$18,276,000 is of Recently acquired the Edison III pany, the Municipal Electric Light  **ALLIE**  Boston MassJune 18:  American Electric Heating Co	100 le of community Co.	the stock non and \$ nating Co.	holders til 2,551,200 pr of Brook STRIE	e capital stock wireferred. Iyn and its consti	106     as red   £x   tuent	106 uced div. ccm-
Thomson-Houston Welding Co	100 le of community Co.	the stock non and \$ nating Co.	holders til 2,551,200 pr of Brook STRIE	e capital stock wireferred. Iyn and its consti	106     as red   £x   tuent	106 uced div. ccm-
Thomson-Houston Welding Co  You Aug. 17 last by a majority vot to \$20,827,200, of which \$18,276,000 is of Recently acquired the Edison III pany, the Municipal Electric Light  **ALLIE**  Boston MassJune 18:  American Electric Heating Co	100 le of community Co.	the stock non and \$ nating Co.	holders til 2,551,200 pr of Brook STRIE	e capital stock wireferred. Iyn and its consti	106     as red   £x   tuent	106 uced div. ccm-
Thomson-Houston Welding Co  Yon Aug. 17 last by a majority voi  \$20,827,200, of which \$18,276,000 is  I Recently acquired the Edison Ill  pany, the Municipal Electric Light  ALLIE  BOSTON MASS.—June 18:  American Electric Heating Co  Sirect Ry. & Illu'g Propertiespfd  United Electric Securities Copfd.  New YOPK.—June 18:	100 le of community Co.	the stock non and \$ nating Co.	1,248,700 1,000,000	e capital stock wireferred. Iyn and its consti	105 as red 1 Ex tuent	106 uced div. ecm-
Thomson-Houston Welding Co	100 e of community Co.	the stock non and \$ nating Co.	holders til 2,551,200 pr of Brook STRIE	e capital stock wireferred. Iyn and its consti	105 as red ‡ Ex tuent	106 uced div. ccm-
Thomson-Houston Welding Co  Woonsocket (R. I.) Electric Co  On Aug. 17 last by a majority voi  \$20,827,200, of which \$18,276,000 is  Recently sequired the Edison Illeany, the Municipal Electric Light  ALLIE  BOSTON MASS.—June 18: American Electric Heating Co  Street Ry. & Illu'g Propertiespid United Electric Securities Copid.  New YOPK.—June 18: Consolidated Electric Storage Co  Safety Car Heating & Lighting Co	100 e of community Co.	the stock non and \$ nating Co.  INDU:  10,000,000 4,500,000	STRIE	spital stock wireferred. lyn and its constites.  12 p. sh. Jan. 25, '99 28.50 p.sh. Nov' 99	105 as red 1 Ex tuent	106 uced div. com-
Thomson-Houston Welding Co  Woonsocket (R. I.) Electric Co  On Aug. 17 last by a majority voi  \$0,827,200, of which \$18,276,000 is  I Recently acquired the Edison Ill pany, the Municipal Electric Light  **ALLIE**  BOSTON MASS.—June 18: American Electric Heating Co  Street By. & Illu'g Propertiespfd  United Electric Securities Copfd.  New YOPK.—June 18: Consolidated Electric Storage Co  Safety Car Heating & Lighting Co  Sorthington Pump Co	100 e of community Co.	the stock non and \$ nating Co.  INDU:  10,000,000 4,500,000	1,248,700 1,000,000	special stock with the capital stock with the capital stock with the constitution of the constitution of the constitution of the capital stock with the constitution of the capital stock with the capital sto	105 as red ‡Ex tuent	106 uced div. ccm-
Thomson-Houston Welding Co  Woonsocket (R. I.) Electric Co  On Aug. 17 last by a majority voi  \$20,827,200, of which \$18,276,000 is  Recently sequired the Edison Illeany, the Municipal Electric Light  ALLIE  BOSTON MASS.—June 18: American Electric Heating Co  Street Ry. & Illu'g Propertiespid United Electric Securities Copid.  New YOPK.—June 18: Consolidated Electric Storage Co  Safety Car Heating & Lighting Co	100 e of community Co.	the stock non and \$ nating Co.  INDU:  10,000,000 4,500,000	STRIE	special stock with the capital stock with the capital stock with the constitution of the constitution of the constitution of the capital stock with the constitution of the capital stock with the capital sto	105 as red ‡ Ex tuent	106 uced div. com-
Thomson-Houston Welding Co  Woonsocket (R. I.) Electric Co  On Aug. 17 last by a majority voi  \$20,827,200, of which \$18,276,000 is  I Recently acquired the Edison Ill  pany, the Municipal Electric Light  ALLIE  BOSTON MASS.—June 18:  American Electric Heating Co  Sirect Ry. & Illu'g Propertiespfd  United Electric Securities Copfd.  New YOPK.—June 18:  Consolidated Electric Storage Co  safety Oar Heating & Lighting Co  Worthington Pump Coom  Worthington Pump Co	100 e of community Co.	the stock non and \$ nating Co.  INDU:  10,000,000 4,500,000	1,248,700 1,000,000	special stock with the capital stock with the capital stock with the constitution of the constitution of the constitution of the capital stock with the constitution of the capital stock with the capital sto	105 as red ‡Ex tuent	106 uced div. ccm-
Thomson-Houston Welding Co	100 le of communitation (Co. 100 le of 100 le	the stock non and \$ nating Co.  INDU:  10,000,000 4,500,000 5,500,000 2,000,000	1,248,700 1,000,000	special stock with the capital stock with the capital stock with the constitution of the constitution of the constitution of the capital stock with the constitution of the capital stock with the capital sto	105 as red ‡ Ex tuent	106 uced div. ecm-
Thomson-Houston Welding Co  Yon Aug. 17 last by a majority voi to \$20,827,200, of which \$18,276,000 is a Recently sequired the Edison Illustry, the Municipal Electric Light ALLIE  BOSTON MASS.—June 18: American Electric Heating Co	50 100 100 100 100 100 100 100 100 100 1	the stock non and \$ nating Co.  INDU:  10,000,000 4,500,000 5,500,000 2,000,000 1,500,000	1,248,700 1,000,000	special stock with the capital stock with the capital stock with the constitution of the constitution of the constitution of the capital stock with the constitution of the capital stock with the capital sto	105 as red ‡Ex tuent	106 uced div. ccm-
Thomson-Houston Welding Co  Woonsocket (R. I.) Electric Co  On Aug. I? last by a majority voi  \$20,827,200, of which \$18,276,000 is  I Recently acquired the Edison III  pany, the Municipal Electric Light  ALLIE  BOSTON MASS.—June 18:  American Electric Heating Co  Sirect Ry. & Illu'g Propertiespfd  United Electric Securities Copfd.  New YOPK.—June 18:  Consolidated Electric Storage Co  Safety Car Heating & Lighting Co  Worthington Pump Co	500 1000 1000 1000 500 500 500 1000 100	10,000,000 4,500,000 2,000,000	holders 11,2,551,200 prof Brooks  STRIE  1,248,700 1,000,000  5,500,000 2,000,000	92 p. sh. Jan. 28, 199 \$8.50 p.sh. Nov 199	105   58 red   1 Ex 	106 uced div. com:
Thomson-Houston Welding Co  Woonsocket (R. I.) Electric Co  On Aug. 17 last by a majority voi  \$20,827,200, of which \$18,276,000 is a Recently acquired the Edition Illeany, the Municipal Electric Light  **ALLIE**  BOSTON MASS.—June 18: American Electric Heating Co  Street Ry. & Illu'g Propertiespfd United Electric Securities Copfd.  New YOPK.—June 18: Consolidated Electric Storage Cos  is fety Oar Heating & Lighting Co  Worthington Pump Co	500 1000 1000 1000 1000 1000 1000 1000	the stock non and \$ nating Co.  INDU:  10,000,000 4,500,000 2,000,000 1,500,000 1,500,000 1,500,000 8,500,000	STRIE	92 p. sh. Jan. 26, '99 ss.50 p.sh. Nov'99	105 bs red 1 Ex tuent 150 109	106 uced div. com-
Thomson-Houston Welding Co	100 e of community of co. 100 100 100 100 100 100 100 100 100 10	10,000,000 4,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 5,500,000	holders til 2,551,200 pr of Brook STRIE 1,248,700 1,000,000 5,500,000 2,000,000	92 p. sh. Jan. 28, 199 \$8.50 p.sh. Nov 199	105	106 uced div. ccm
Thomson-Houston Welding Co	500 100 100 100 50 100 50 50 100 50 50 100 10	the stock non and \$ nating Co.  INDU:  10,000,000 4,500,000 2,000,000 1,500,000 1,500,000 505,000 505,100	STRIE  1,248,700 1,000,000  5,500,000 2,000,000	92 p. sh. Jan. 26, '99 ss.50 p.sh. Nov'99	106	106 uced div. ccm
Thomson-Houston Welding Co	100 e of community of co. 100 100 100 100 100 100 100 100 100 10	10,000,000 4,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 5,500,000	STRIE  1,248,700 1,000,000  5,500,000 2,000,000	92 p. sh. Jan. 26, '99 ss.50 p.sh. Nov'99	105	106 uced div. ccm
Thomson-Houston Welding Co	500 100 100 100 50 100 50 50 100 50 50 100 10	the stock non and \$ nating Co.  INDU:  10,000,000 4,500,000 2,000,000 1,500,000 1,500,000 505,000 505,100	1,248,700 1,000,000 2,000,000	second and the constitution of the capital stock with the constitution of the constitu	106	106 uced div. ccom

1,250,000

500,000

Miscellaneous.-June 18.

# BONDS.

PASSENGER RAILWAY.						PASSENGER RAILWAY.						Charleste	
	Amount.			Interest				Amount.			Testament		
NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.	NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Astro
Albany N. Y.  Date of Quotation—June 18, 1900  The Albany Ry. CoCons. mig. 5s. 1The Albany Ry. CoGen. mig. 5s. 1Watervleit Turnpike & RE.1st mig. 6s. Watervleit Turnpike & EE2d mig. 6s. Troy City Railway Co	\$500,000 750,000 850,000 150,000		1947	M. & N. M. & N. M. & N.	*117½ *117 *125 *128 *116½	119% 127% 127	New Orleans La.  Dote of Quotation—June 18, 1900.  Canal & Claiborne RR cons mig. 8s. Crescent City RR	\$150,000 5,000,000 416,500 5,000,000 850,000 800,000 800,000	8,000,000 899,000 2,599,500	1899 1948 1908 1948 1907 1912	J. & J. F. & A. J. & J.	10634 108 112	112 118
Baltimore Md.  Date of Quotation—June 18, 1900 United Electric Ry. Colst mtg. g. 4s. Baltimore City Pass. Ry. 1st mtg. g. 5s. Baltimore Traction Colst mtg. 5s. Baltimore Traction Ly. Extended the Ly. 5s. Baltimore Traction Co. Convertible 5s. Balt. Trac. Co. Coll. Trust, 1st mtg. g. 5s. Baltimore Traction Co. Convertible 5s. Central Pass. Ry. Co	88,000,000 14,000,000 2,000,000 1,500,000 1,750,000 750,000 800,000 96,000 8,000,000 1,000,000	18,000,000 2,000,000 1,500,000 1,250,000 1,750,000  117,000 580,000 8,000,000 1,000,000	1949 1911 1929 1901 1942 1900 1906 1912 1982	J. & D. M. & N. M. & N. M. & S. J. & D. J. & J. N. & M. J. & J. M. & N.	102 74% 118% 119 104% 121 101 102%  119 116 117	102½ 75 120  121½ 121 117	New York.  Date of Quotation—June 18, 1900.  Atlantic Ave. (Brooklyn) Imp. g. 5s. Atlantic Av. (Brooklyn). Isigen. mig. 5s. thilantic Av. (Brooklyn). Cons. mig. 5s. Broadway & 7th Ave isign. mig. 5s. Broadway & 7th Ave let mig. 5s. Broadway & 7th Ave 2d mig. 5s. Broadway & 1st. ave 2d mig. 5s. Broadway Surface 2d mig. 5s. Brooklyn City RR. Co 1st cons. mig. 5s. Brooklyn City & Newtown let mig. 5s. Brooklyn Bath & W. E. RR. Gen. mig. 5s. Brooklyn Heights RR 1st. mig. 5s. Brooklyn Q's Co. & Sub'n 1st mig. 5s. Brooklyn, Q's Co. & Sub'n 1st mig. 5s. Brooklyn, Q's Co. & Sub'n 1st cons. 5s	1 1.000.000	1,966,000 7,650,000 1,500,000 1,125,000 1,100,000 2,000,000 448,000 250,000 2,750,000	1909 1981 1948 1904 1914 1924 1905 1941 1989 1988 1941 1941	M. & S. A. & O. J. & D. J. & D. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. M. & J.	95 107% 115 128 104 108 115 105 116 115 101 104 112 107	110 116 125 105 × 110 117 106 117 116
## All of the bonds of the above companies, marked t, have been assumed by the United Railways & Electric Company.  BOSTON, MASS.  Date of Quotation— June 18, 1900.  †Lynn & Boston RR	5,879,000 8,000,000 2,000,000 500,000	8,702,000 8,000,000 2,000,000 47,000	1902	J. & D. M. & N. M. & S. J. & J. J. & J.	114 104% 112	115 106	Brooklyn Rapid Transit gold 5s. Bleecker St. & Fuli'r Fer'y RR. 1st mig. 7s. Cent P'k, N. & E. R. RR. 1st cons. mig. 4s. Central Crosstown RR 1st mig. 6s. Coney Island & Brooklyn RR. 1st mig. 5s. 2D Dock, E. Bd'y & Bat'y R. gen.mig. g. 5s. Dry Dock, E. Bd'y & Bat'y RR. serip 5 %. Eighth Av. RR. Co Cert. indebt. 6 %. 42d St., Man. & St. Nich. Av Ist mig. 6s. Lex. Ave. & Pav. Ferry RR. 1st mig. g. 5s. Metropolitan St Ry Oo. g. m. cl. tr. g. 5s. Second Avenue Ry Deb. 5s. South Ferry RR. Co 1st mig. g. 5s. South Ferry RR. Co	1,200,000 250,000 1,000,000 1,000,000 1,000,000 1,500,000 5,000,000 1,500,000 1,500,000 1,500,000 300,000 1,500,000 300,000 1,500,000 300,000 1,500,000 300,000 1,500,000 2,000,000	700.000 1,200,000 250,000 800,000 1,100,000 1,000,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 2,000,000	1922 1908 1932 1914 1914 1910 1915 1998 1997 1909 1909 1912 1919 1987 1909 1906 1942	J. & D. M. & N. J. & J. F. & A. F. & A. J. & J. M. & S. F. & A. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J.	1091/4 941/4 107 125 101 117 102 108 1161/4 82 120 120 120 120 1180 118/4 110/4 116 118/4 110/4	100/ 109 120 120 105 117 125 121 109 117 1123/ 108 116
Chicago III.  Date of Quotation—June 18, 1900.  Ohicago City Ry	6,000,000 400,000 1,000,000 7,500,000 1,500,000 1,500,000 15,000,000 500,000 2,500,000 2,500,000 2,700,000 12,500,000	4,619,500 400,000 500,000 7,500,000 750,000 8,781,200 15,000,000 500,000 2,500,000 8,969,000 700,000 6,000,000	1908 1929 1929 1907 1982 1928 1942 1906 1911 1900 1927 1928 1911	J. & J. J. & J. F. & A. J. & J. J. & J. M. & N. M. & N. J. & Is.	101%  1085%  96 106  108	23/4 102 109  96/6  111 102 107	itWestchester Electric RRlsi mig. 5s. †\$1,085,000 in escrow to retire gen. mig. bonds. 184,850,000 in escrow to retire maturing obligations. †\$552,000 in escrow to retire lst and 2d mig. bonds. 2In treasury, \$80,000. 11 Guar. by Union By. Oo. TOPONIO Canada. Date of Quotation—June 18, 1900. Montreal St. Ry		800,000 2,200,000		M. & S. M & S.	::::	-
TRedeemable at option on 60 da. notice. Trunded debt assumed by Ohicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.  18ubject to call after Oct. 1, 1899, at 110 and interest.  1Assumed by W. Chi. RR. Co., lessee.  1Int. guar. by W. Chicago St. RR. Co.  Cincinnati. O.  Dateof Quotation—June 18, 1900  Cin. New. & Cov.St. Ry. 1st Con.mtg. g.5s.  1Mt. Adams & Eden P'k In 1st mtg. 6s.  1Mt. Adams & Eden P'k In 1st mtg. 6s.  1Mt. Adams & Eden P'k In 1st mtg. 6s.  1Mt. Adams & Eden P'k In 1st mtg. 6s.  1Mt. Adams & Eden P'k In 1st mtg. 6s.  1Mt. Adams & Eden P'k In 1st mtg. 6s.	8,000,000 46,000 100,000 581,090 250,000	2,500,000 46,000 100,000 581,000 250,000	1922 1900 1905 1906 1912	J. & J. A. & O. A. & O. M. & S. M. & S.	1141/4 1081/4 114 1088/4 1215/5 1823/4	115 104  1223/4 187	Date of Quotation—June 18 1500 Continental Pass. By	100,000 150,000 250,000 500,000 1,125,000 5,698,210 200,000 1,800,000 100,000 29,785,000 750,000	810,000 200,000 100,000 250,000 458,000 867,000 200,000 1,018,000 500,000 29,724,876 246,000 750,000	1900 1898 1901 1905 1911 1912 1948 1910 1917 1908 1911 1945 1906	J. & J. J. & J. M. & S.		
ISO. Cov. & Clin. St. Ry	600,000 8,000,000 2,000,000 8,500,000 1,500,000 1,000,000 600,000 600,000	500,000 2,500,000 2,000,000 1,249,000 1,500,000 1,000,000	1908 1922 1909 1918 1918 1910 1922 1915	J. & J. M. & S. M. & N. M. & S.	1063/4 118/4 1053/4 106	107 114 ½ 106 107 	pay for the shares of the Electric and People's Traction lines purchased.  Pittsburg. Pa.  Date of Quotation—June 18 1900  Birmingham, Knox & Allentown	500,000 875,000 1,250,000 1,500,000 50,000 1,250,000 750,000 250,000 1,500,000 1,500,000 2,500,000 1,500,000 500,000	750,000 250,000 750,000 1,500,000 500,000 1,400,000	1980 1927 1980 1918 1942 1928 1924 1927 1929 1922 1980 1984	M. & S. J. & J. J. & J. J. & J. M. & N. J. & J. M. & N. J. & J. M. & S	1111/6	118
Date of Quotation—June 18, 1900 †Detroit Citisens' St. Ry	7,000,000 400,000 1,800,000	8,885,000 877,000 1,800,000	1902	A. & O.	105	102%	Providence R. I.  Date of Quotation - June 18, 1900.	50,000 9,000,000	•	1910	J. & D.	116	118
Date of Quotation— June 18 1100  Mew Haven St. Ry lat mtg. g. 5s.  New Haven (Edgewood Div.) lst. mtg. 5s.  Winchester Avenue RR—lst mtg. g. 5s.  Winhester Avenue RR Deben. g. 5s.	600,009 250,009 100,000 100,000	600,000 250,000 800,000 24,000	1914 1912	J&D M&N	111 111 109	• Unit	Date of Quotation- June 18. 1500 Baden & St. Louis RR1st mtg. 5s. Cass Ave. & Fair Gds Ry1st mtg. 5s. Citizens' Railway Co1st mtg. 5s Comp. Hts. Un. De. & Mer. Ter1st	250 000 1,818 000 2,000,000 1 600 000	250,000 1,813 000 1,500,000 000 000	1912 1907	]&] ]&] J&J	101% 101% 109 17	1021/ 1021/ 1091/ 118

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#### PASSENGER RAILWAY. RANG. Authorized Insued. MA. Asked St. Louis. ictation – June 18. 1900 Date of Qu 400,000 | 1905 | M. & N. | 1,600,000 | 1911 | F. & A. | 800,000 | 1916 | M. & S. | 800,000 | 1910 | A. & O. | 125,000 | 1902 | J. & D. | 75,000 | 1902 | M. & N. | 800,000 | 1904 | J. & J. | 200,000 | 1906 | J. & J. | 800,000 | 1909 | M. & N. | 800,000 | 1918 | J. & J. | 1,901,000 | 1900 | M. & N. | 400,000 1,500,000 1,000,000 400,000 125,000 75,000 1,000,000 105 109 106 102 100 99 1/4 108 80 106 116 100 101 100 % 104 84 108 118 100 % 122 75,000 2,000,000 2,000,000 800,000 500,000 500,000 | ..... | M. & N. 500,000 | 1918 | J. & J. 1,091,000 | 1918 | J. & J. & J. 1,787,000 | 1918 | J. & J. TOontrolled by St. Louis RR. Co. 1Controlled by Union Depot RR. Co. 1Controlled by Lindell RR. Co. 1\$200,000 in escrow to retire 1st & 3d mig. 3\$600,000 in escrow. 1|\$200,000 in escrow to retire 1st mig San Francisco Cal. Date of Quotation-June, 1900. 1,000,000 650,000 1,000,000 114 126} 8,000,000 2,000,000 | 1918 | A. & O. | 1912 | J. & J. | 250 000 | 1914 | 700,000 | 1914 | M. & S. | 1918 | M. & N. 126 × 105 × 115 2,000,000 850,000 107 125 1.000,000 Washington D.C. 132 Miscellaneous. minocinal Pous. Date of Quotation—June 18, 1900. Bridgeport Traction Oo.......lei mig. 5s. Buffalo (N. Y.) Ry. Co......Cons. mig. 5s. t' tisene' St. B. (Ind'polis). let cons. m. 5s. tOrosstown St. Ry. (Buffalo). let cons. g. 5s. tOnsolidated Traction (N. J.)..ist mig. 5s. tOrosst'n St. Ry. (Colu's, O.)...lst mig. 5s. tOrosst'n St. Ry. (Colu's, O.)...lst mig. 5s. touser of the Columbian Colum Date of Quotation-June 18, 1904). 1,688,000 1928 8,548,000 1931 F. & A. 2,866,000 1932 M. & N. 2,261,000 1932 M. & N. 18,965,000 1932 J. & J. 18,965,000 1933 J. & D. 572,000 1933 J. & D. 922,000 1933 J. & D. 922,000 1930 J. & J. 4,981,000 1930 J. & J. 4,981,000 1930 J. & J. 2,378,000 1939 J. & J. 450,000 1930 J. & J. 499,000 1920 J. & J. 2,378,000 1928 J. & J. 2,000,000 1930 J. & A. 2,000,000 1931 J. & D. 4,298,000 1937 1,000,000 1900 2,000,000 5,000,000 4,000,000 110 108 118 104 112 115 11114 115 20 80 119 1104 108 105 118 1118/g 115% 4,000,000 6,000,000 8,000,000 550,000 500,000 1,250,000 8,000,000 5,500,000 1,000,000 119% •••• 105¾ 108 106 #\$1,000,000 in escrow to retire 1st and mig. bds. 13500,000 in treasury. Bonds guar. by Buffalo By. Co. 18760,000 in escrow to retire bonds of C. Si. BR. Co. 1887,000 in treasury. 18960,000 res'ved to redeem prior liens 18820,000 in escrow. ELECTRIC LIGHT AND ELECTRICAL MFG. COS Roston, Mass Date of Quotation-June 18 1900 Delaware Gas Li. Co., . . . . . lst m. 5e, g. Edison Elec. Illuminating Co., Buston.... General Electric Co.. gold coup, deb. 5e.. 106 157 116 800,000 103 Quar. 8,750,000 1922 Pittsburg Pa Date of Quotation-June 18, 1900 1911 J. & J. M. & S. 110 4,812,000 2,188,000 5,000,000 .... 124 1224 124 1940 A. & O. A & O. F. & A. 103 122 100 120 102½ TELEPHONE AND TELEGRAPH. Miscellaneous. 100% 7. & A ..... J. & D. ALLIED INDUSTRIES. Miscellaneous Date of Quotation-June 18, 1100. 600,000 500,000 25 107 1942 1904 106 J. & J J & D. 127 115 75,000 tNeminal.

# NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 161@16gc.; Lake, 161@16g ..; casting, 161@161c.

The Sonora Copper Company of New York, capital \$5,000,000, has been incorporated in Delaware.

The General Carriage Company of New York City took title recently to the Sixth Avenue car stables.

The Altha Automobile & Power Company of New York, capital ₹500,000, has

been incorporated in Delaware. The Gold Car Heating Company has secured the contract for electric heaters for the Boston Elevated Railway.

It is stated that the Brooklyn (N. Y.) Elevated Bailroad system will be oper-

ated entirely by electricity by July 15. The Yates Electric Light Car Company, capital \$300,000, has been incorporated in Albany to operate in Yates County, N. Y.

The Chicago Telephone Company has declared the regular quarterly dividend of 3 per cent., payable July 2. Books close June 26.

The United Traction & Electric Company of New Jersey has declared a dividend of 1 per cent., payable July 2. Books closed June 19 and reopen July 3

A dividen 1 of 5) cents per share has been declared by the directors of the R:ading (Pa.) Traction Company, payable July 1, to stock holders of record June 12.

The Ois Elsystor Company has declared the regular quarterly dividend of laper cent. on its preferred stock, payable July 14. Books close July 3 and open

The Hartford Street Railway Company will issue \$2,100,000, out of an authorized \$3,000,000 bands bearing 4 per cent. interest, and will retire \$1,800,000 5 per cent. debentures.

The Westinghouse Electric & Manufacturing Company has declared a quarterly dividend of 12 per cent. on its preferred stock, payable July 2. Books close June 21 and reopen July 3.

The North Chicago Street Railway Company, an important part of the Union Traction Company, will probably change its motive power from cable to electricity if it can get the franchise.

Coal exports from the United States during the ten months ended with April were nearly 5.) per cent. in excess of those for the like period last year, and ab. 80 per cent. ahead of 1898.

The Biston Electric Light Company will pay a regular quarterly dividend of \$2 persoare July 14, to stocaholders of record June 3), 1930. Transfer books will be closed from June 30 to July 16.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 14 a,15½; New York Electric Vehicle Transportation, 7¼(a,7¼; New England Transportation, 3(a,3¾; Gramophone, 35(a,40.

The directors of the United S. ates Machinery Company have declared the regular quarterly dividends of 1½ per cent. on the preferred and of 2 per cent. on the common stock, payable July 14. Books close June 20 and reopen July 2.

The Electrical Venicle Company of New York will pay new preferred stock share for share and a bonus in common for the stock of the Columbia Automobile Company, the Columbia Electric Venicle & Manufacturing Company and the New Haven Carriage Company.

The Baltimore County Water and Electric Company has filed a mortgage for \$1,000,000 to secure an issue of 5 per cent 4) year gold bonds. This company was recently organ zed by the consolidation of the Chesapeake Electric and Water Company with the Catonsville Water Company.

The General Electric Automobile Company of Philadelphia will sell out to a successor company, the capital of which is \$3,003,000. The new company will pay the old debts and raise working capital. It will issue stock at 80 per cent. to present holders, and creditors have agreed to take 5,000 shares at 83.

The Brooklyn Rapid Transit Company has opened two new lines to Manhattan Beach at 15 and 2) sents fare, respectively. One is from the Brooklyn bridge over the Kongs County Elevated and Brigation Board rationals. The other is by ferry from Wattehall street over the South Brooklyn Terminal Company and the Cul-

The Consolidated Car Heating Company has declared the regular semi-annual dividend of 1½ per cent. and an extra dividend of 3½ per cent., payable August 1 to stockholders of record July 16. Over 8 per cent. was earned. The board of directors re-elected includes Anthony N. Brady, Chas. J. Peabody and Geo. Westing-

Since June 1 the gross income from traffic of the Chicago Union Traction system has decreased at the rate of about \$1,000 per day, compared with last year. While perhaps the batter pirtion of this decrease must be attributed to the Northwestern Elevated competition, it is still true that weather conditions since the beginning of the month have been very unfavorable to surface traffic.

According to an exchange Chicago is to have an electric light war. It is to be a coercive campaign to force a sale of the Chicago Edison Company. The purpose is to concentrate in the Whitney E.kins Brady-B.lliugs cotorie the electric and gas lighting business of Chicago, with the intention ultimately to control surface traction and electric power distribution throughout the city whenever that can be effected.

A dispatch from Houghton, Mich., states that the two shafts of the Calumet & Hecla mine, which were closed during the recent fire, have been examined by Mine Inspector Hall and pronounced safe. Work will be resumed immediately in these parts of the mine. The rest of the shafts will be inspected as soon as possible. It is probable that No 2 shaft, where the fire originated, was so badly burned that

The Boston "News Bureau" says: So much uncertainty has been, occasioned as to what disposition the Western Union Telegraph Company was to make of its recently authorized \$21,000,000 bonds, the idea prevailing in some quarters that it was to enable active competition in the telephone field, that we give herewith the company's official statement regarding this matter: "From the proceeds of the sale of the \$10,000,000 of the bonds the undermentioned bonds have been retired and paid off; 6 per cent, bonds due March 1, 1900, \$761,000; 7 per cent, bonds due May 1, 1900, \$4 921,000; to provide for new orderty and new lines constructed in excess of surplus earnings since 1897, 1898–1899 \$2,076,50; balance to be used for the acquirement of new property and the construction of new lines after June 31, 1899, \$2,212,499; total, \$10,000,000. The remaining \$10,000,000 of the authorized about \$1,000,000 thereof are reserved for the purpose of retiring the \$1,163,000 of 7 per cent, real estate bonds (less the sinking fund), due May 1, 1912, which are a lien upon the Western Union Building, No. 195 Broadway, New York, and the remaining \$9,000,000 thereof are reserved and shall be used solely for improvements, betterments and extensions of the property and the development and enlargement of the business of the Felegraph Company, or for such other corporate purposes as may be authorized by law."

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#### EDITORIAL NOTES.

Motive Power for the Cross-Town Lines of New York City. Although it has not been definitely stated that the compressed air system of street-car propulsion that is employed by the Metro-

politan Street Railway Company of New York City on its Twenty-eighth and Twenty-ninth street cross-town lines, is to say the least a disappointment, still one would be led so to believe from the fact that at a recent meeting of the stockholders of the above company it was announced that a storage battery system would shortly be given a trial on the Thirty-fourth street cross-town line. And in our opinion this will be a case of "out of the frying-pan into the fire."

That the compressed-air system now in use has not proven entirely satisfactory may readily be inferred from the number of accidents that have occurred, and which are directly attributed to this form of motive power. Not long ago a tank exploded injuring several employes, while every now and then the mechanism of a car becomes deranged, necessitating a more or less protracted delay. Add to these mishaps the fact that compressed air cars puff and snort like a locomotive, and leave in their wake a trail of grease and filth, and it is not a very difficult matter to see why some other system is about to be tried on Thirty-fourth street.

But the question arises, will the storage battery system prove any more satisfactory than the compressed air? To the general public it certainly will, owing to the absence of the above-mentioned objections. other hand the company will undoubtedly soon find that the operating expenses on such a line are exceedingly high, to say nothing of other minor defects. The directors of the Chicago Electric Traction Company have just awakened to this fact, and have decided to change over their system from the battery to the overhead trolley. The Chicago road, however, comprises some twenty odd miles of track, whereas the proposed line in this city will be at the most but a couple of miles in length.

That the problem of installing a suitable system on such a short length of track in a city like New York is a knotty one must be acknowledged, and the reason given by President Vreeland for trying the storage battery system

on Thirty-fourth street was to obviate the cost of building a conduit for an underground trolley, which, he is reported as saying, on a cross-town line was so expensive that it would hardly pay, except on a line where the traffic was very heavy. Referring to a rumor that the company contemplated abandoning the air power system he said:

"It would have been quite as reasonable to have said we were going to abandon electricity when we began experiments with air power as to say now we are to abandon air power because we undertake to experiment with the storage battery. So far from abandoning the use of air power, we are equipping the Twenty-eighth and Twenty-ninth street roads with new heavy rails and are awalting an entire new equipment of cars with a different type of motor from those now in use, in which all the defects experimentally developed in the first lot are eliminated"

In spite of the above statement it is safe to assert that had the compressed air system come up to expectations there would have been no necessity for giving the storage battery system a trial. The cost of building an underground trolley system is undoubtedly great, but it is questionable whether after expending a large sum of money experimenting with compressed air and storage batteries, the company will not in the end be obliged in self-defence to have recourse to the conduit system.

\* \* \*

A Decision
Relating to
Electric Furnaces.

Frequently a suit arises over a patent that threatens to revolutionize the methods of an entire industry. The famous Ber-

liner case was such a one, while still more recently a decision was handed down in Philadelphia which may seriously affect, if not entirely cripple, some of the large manufacturers of products requiring electric furnaces. The suit in question is that of the Electric Smelting and Aluminum Company of Cleveland, Ohio, versus the Carborundum Company of Niagara Falls, N. Y., for infringement of patent rights. The patent involved is one issued to E. H. and A. H. Cowles on June 9, 1885, for an improvement in processes for smelting ores by the electric current.

The Cowles patent covers the mixing of carbon with the substance to be reduced, which causes a far greater resistance to the passage of an electric current, a consequent rise in tem-

perature and diffusion of heat throughout the mass.

While experimenting with such a furnace many years ago-so the story runs-the Cowles brothers attempted to fuse common sand into rock crystals. A core of carbon fragments was imbedded in the sand, and the current turned on. After an interval the furnace was opened. and a considerable quantity of fused sand was removed. In the center of the mass next to what had been the core of carbon, was found a small quantity of crystals nearly as hard as diamonds. These were thought to be crystals of the element silicon, of which sand is an oxide. Little more attention was given the matter by the Cowles brothers, who turned their attention to the manufacture of aluminum, until Mr. E. G. Acheson, who perfected the process for the manufacture of carborundum, exhibited his product in the various stages of manufacture at the World's Fair in Chicago in 1893. Mr. Alfred Cowles then recognized, or thought he recognized, the crude product as identical with the crystals which he had made. The result was that a suit for infringement was begun. The case was tried before Circuit Judge Buffington in the Western District of Pennsylvania, and was decided adversely to the complainant. In summing up his decision the Judge said:

"Indeed, the process, preparation of ingredients and means employed in the two processes now under consideration are diverse and the desired objects unlike. A like thermo electric agent is employed in both, but with it the substantial likeness ends. Cowles' object was reduction, while Acheson's was composition. One reduced a substance already in existence. the other by composition produced a new pro-With Acheson the new product consumed the carbon constituent of the charge; with Cowles an excess of carbon constituents remained at the close of the process. In Cowles', the charge for functional purposes, occupied the central space between the electrodes. In Acheson's, for functional purposes it was removed from such central space and from electrode contact. In Cowles' an excess of carbon was required in the charge mixture as a current conductor; in Acheson's no such excess was required or used, but the carbon for that purpose was isolated in the central core. Their methods are so radically unlike and are carried out on such diverse lines that we are firmly convinced that the charge of infringement has not been sustained."

The case was appealed and reargued before Judges Gray, Dallas and Bradley, sitting in Philadelphia as the Circuit Court of Appeals. Before a decision was rendered, Judge Bradley retired from the bench, and at the request of the Court the case was again reargued. Judge Bradford, who succeeded Judge Bradley, writes the decision recently handed down. In his decision he lays stress on "the disposition of the resistance material with respect to the material to be treated." It points out that in the Cowles patent claims it is stated that the ore "is usually mixed with the body of granular resistance material," which implies the two need not always be mixed. It points out that, although the description of the process which accompanied the application for the patent mentions mixing the ore and carbon, as does one of the four specific claims made for the patent. The language of the other claims, in the estimation of the court, require merely contact in contradistinction to mixture between the resistance material and the material to be treated. The decision is, therefore, that claims 1, 2, and 4 of the Cowles patent have been infringed."

The case will in all probability again be appealed. If the present decision is sustained it will prove a very serious matter, not only to the Carborundum Company but to other concerns engaged in the manufacture of products requiring the use of electric furnaces. There would seem to be a chance, however, of the patent expiring before the litigation comes to an end.

#### \* \* \*

Bierce Edison and Tesla. Mr. Ambrose Bierce is one of the distinguished newspaper men of the metropolis, and his contributions to the daily journals generally secure a position on the editorial page. We have

admired his artistic way of attacking shams and his pungent paragraphs about brainless labor leaders, but we were astounded to see him enter the electrical field and select two of our noted scientists for subjects to lash with his pen. Under the caption "Edison and Tesia Have Too Many Freak Ideas" Mr. Bierce writes as follows to the "New York Morning Journal":

"In creating the new science of electrology the Author of All Things seems, for some reason to us unknown, to have decreed that only fools should attain to proficiency in it. Of Thomas Edison, the Blind Tom of the science, it may be said that he knows more about electricity and less about everything else than any man living except Nikola Tesla. Neither of these men ever opens his head to tell us what he knows without diverting attention from the performance to the gigantic sum of what he does not know. Both appear to suffer from an incontinence of words aggravated by an impediment in sense. They always think 'the time has come, 'as the walrus said, 'to speak of many things,' and of many things accordingly they do everlastingly and pitilessly speak; but mostly of what they are about to accomplish in the way of turning the world inside out and the universe outside in.

"A favorite topic with these peaceful civilians is war, which they are always going to 'revolutionize' or 'abolish.' Many of this paper's readers will recall Mr. Edison's leglong utterances on this topic just before the Yanko-Spanko unpleasantness—how his electrified water, fired from a garden hose, was to paralyze entire legions, his electrified chains, flung out of two guns each, were to mow them down, his torpedoes, traveling on endless trolley lines under water, were to make smithereens of battle craft, and the rest of it: all showing with clarity his fitness for the great leather medal of the Society of Friends for distinguished services as one of the horrors of peace.

"Mr. Edison's conception of what war is like would, if it could be photographed, resemble a combat between a set of ten-pins and a row of beer bottles.

"And now comes (for the one hundred and forty-ninth time) Mr. Nikola Tesla with the old battle-fire blazing in his eyes—'of which he hath two.' He is going to revolutionize warfare off the face of the earth, the ocean included. The ocean, indeed, appears to have the honor of selection as the best field for his military activity against the demon War. Briefly, the good man has invented an automatic battleship, which needs no crew and can be navigated from port. In an emergency this wonder of the deep can think a bit for itself,

and act on its own best judgment; so if the patriot at the push-button should fall by disease or be elected to Congress it will not greatly matter; the floating fortress will pursue the evil tenor of her way, managing her guns and torpedoes all by her lone self.

"It is a great invention, but Mr. Tesla has somewhat impaired its value to us by coldly intimating his intention to impart it to all the nations of the world, so that wars shall henceforth be carried on without sailors and soldiers. This, he astutely infers, will make it bloodless and therefore uninteresting, and eventually it will fall into the sear and yellow leaf and be waged no more. That will be a great relief, certainly, particularly to those-if any such there be-who have no old ships to sell to the Navy Department. Still, war is not without its advantages. While it is 'on,' for example, we hear nothing from freak electricians and their devices for revolutionizing it. As a whole pond full of yellow frogs are silenced by the splash of a stone, so the roar of arms fool inventors of impossible weapons who hide their diminished heads and are heard to cease.'

We venture to say that Mr. Edison and Mr. Tesla laughed loud and long when they read the above, because we all know that the distinguished gentlemen, to quote the words of a famous writer, "care not for a noisy crowd bellowing and shouting praise or blame."

#### UNDER THE SEARCHLIGHT.

#### Notes and Comments on Various Topics.

THE electricians of the State of Iowa have recently perfected a permanent organization known as the "Iowa Electrical Association," which is for the benefits which may accrue to them as members. W. I. Green of Cedar Rapids is president and G. F. Keffer secretary.

Last week the delegates to the Second Annual Convention of the United States Electrical Contractors' Association enjoyed an automobile parade in this city. Twenty-five vehicles started from Broadway and 25th street. After the parade to Riverside Drive and 129th street, the delegates went on the steamer Laura M. Starin for a trip about the harbor.

The Board of Public Works at Cleveland, O., has announced the retirement of the mule as motive power on the canals of that State. The boats on all Ohio canals will hereafter be propelled by electricity. The canals between Dayton and Toledo are to be equipped within the next four years.

THE Kansas City "Times" states that an employe in a packing house in that city has invented a device for extracting the feathers from chickens that is a considerable improvement over the old way of picking them by hand. There is a receptacle in which the fowl is placed after being killed and into this are turned several cross currents of air from electrical fans revolving at the rate of 5,000 revolutions per minute. In the twinkling of an eye the bird is stripped of its feathers, even to the tiniest particles of down, and the machine is ready for another.

According to a Chicago paper steam railroad officials are becoming alarmed by the increasing prominence of electric lines and fear their competition in long-distance freight and



passenger traffic. Only a short time ago an Illinois corporation was formed to build a network of electric lines in the northern part of the State. This will be equipped for freight business. One indication of the steam railroads' suspicion of their rising competitors is a late action of the Michigan Central road in canceling its traffic agreement with the St. Catherine and Toronto Railroad because the latter has recently changed from steam to electric power. The electric lines in and about Chicago have cut into the suburban business of the steam railroads. The St. Paul, recognizing this, is now seeking an ordinance which will permit the substitution of electricity for steam. So important has this suburban and interurban business become that Cicero J. Lindley of the Illinois Railroad and Warehouse Commission, in his address before the National Convention of Railroad Commissioners in Milwaukee, suggested that electric lines be placed under the control of a commission as steam railroads are now.

THE New Jersey & Hudson River Railway & Ferry Company, formerly known as the Bergen County Traction Company, which operates between the Fort Lee Ferry, Englewood and Hackensack, N. J., has just completed its line into the latter city. On Thursday last the first car containing officials of the company and their friends passed over the new stretch of track. It was a gala occasion, the carwhich by the way was also new-being decorated with flags. A portion of the construction work comprises a handsome and substantial iron truss bridge over the Hackensack River. After examining the bridge and trestle, and being "shot at" by a photographer, the officials and their friends were carried back to a little grove, where under the friendly shade afforded by the trees a most appetizing collation was served.

THE American Association for the Advancement of Science began its forty-ninth annual session on Monday last in Havemeyer Hall of Columbia University. The programme included an address by Prof. G. K. Gilbert, the retiring president, who introduced the newlyelected president, Prof. R. S. Woodward of Columbia University. The council of the Association held an executive meeting at the Hotel Majestic on the 23d inst. The principal business was the election of about two hundred and fifty new members, among whom were Cornelius N. Bliss, Senator T. C. Platt, Walter S. Logan, James S. Benedict, Edward Cooper, John S. Eno, Dr. R. H. Sayre, Prof. E. B. Wilson, of Columbia University; President J. G. Schurman, of Cornell; Abram S. Hewitt, Mrs. E. L. Godkin and Mrs. Henry Draper.

THE University of Heidelberg, after an investigation into the effect upon the eyesight of the electric incandescent and the gas incandescent light, has decided that neither the electric light nor the incandescent lightif properly placed in regard to the eye-has any bad effect upon the eyes. In the case of the electric incandescent lamp, such injurious effect is utterly impossible under ordinary conditions. It was found that incandescent gas more nearly approaches the character of daylight than does the electric light, and on the principle that artificial light which has a spectrum most nearly resembling that of sunlight is the best for the eyes, incandescent gas has a sure future before it for interior lighting.

The heat given out by the newer forms of incandescent gas is estimated at only one-half that of the electric light. On the other hand, there is no vitiation of the atmosphere where the electric light is used. Finally the committee which had the subject in hand came to the conclusion that for the lighting of rooms, especially concert halls and lecture rooms, where many people remain for long periods at a time, the electric light is without doubt to be preferred to all others from a hygienic point of view.

ELECTRIC dog carts are being built in England which carry four passengers and run fifty miles with one charge. The cart has three speeds-three, six and twelve miles an hour.

A HIGH power electric motor car was tested over the New Canaan (Conn.) branch of the Consolidated Railroad on June 21, and the officials of the road are confident that it can maintain its alleged speed of sixty-five miles an hour. There are two motors to each truck. The car is the first of a number which are to be used between Providence and Fall River. The distance is seventeen miles and it is proposed to make the trip in fifteen minutes.

THE recent decision of the Supreme Court permitting the operation of frieght cars on surface railroads is to be taken advantage of by the Brooklyn Rapid Transit Company whose counsel, John D. Walls, is reported as saying: "We realize that with a freight department or delivery attached to our road we can give the people a quicker and much cheaper service than they now have. It will also remove from the streets many of the present obnoxious trucks. I believe we can deliver freight to all parts of Brooklyn for one-quarter of what it now costs; oh, yes, I really believe it could be done for even less than that. We now operate express cars and they interfere with no person and the public gets the benefit of the improved service."

THE electrical department of the Reading (Pa.) Company is conducting a series of experiments at the locomotive plant at Reading with a view of ascertaining just what power will be required to run the machinery connected with the shops now in course of construction. It is understood that all the machinery as well as the traveling cranes, fans, etc., will be run by electricity. The illuminating of the yards and stations about Reading and its suburbs will be done from the main power house of the company.

In order that visitors in Detroit, Mich., may see the best part of the city cheaply and comfortably, Vice-President Hutchins of the Citizens' Street Railway Company is about to inaugurate a novel experiment in street railway use in the form of a sort of a tallyho trolley car, which will be put in service July 1. Every morning the car will start from the Russell House at 9 o'clock out Woodward avenue to the city limits, back again through the city, out Jefferson avenue to the Waterworks park and return to the Russell House. The round trip will consume two hours, and will be made leisurely. The same trip will be made five times during the day. The fare is to be 25 cents.

A "Tramways and Light Railways Exhibition" is now being held under the direction of the "Tramway and Railway World" at the

Royal Agricultural Hall, London, England, to terminate July 4. The exhibition has been arranged with the object of enabling municipal and other local authorities, tramway directors and managers, as well as the general public to examine the latest apparatus designed for the equipment of mechanical tramways and light railways, both surface and underground. The following prizes are offered: (1) A prize of £25 for the best invention for securing a dry seat on the tops of tramcars and omnibuses in all conditions of weather; (2) £25 for the most practical and efficient life-saving guard or fender for tramcars.

Mr. Laliberte, chairman of the Quebec Harbor Commissioners, has submitted to that body a project of great importance, looking to the harnessing of the tides in the harbor of Quebec, and the utilizing of the enormous power contained in them. There are immense electrical possibilities in this tidal power, hitherto running to waste, which could be used to operate grain elevators, saw, pulp, rolling mills, factories and other industrial enterprises. No other city in Canada, except St. John, N. B., has such a rise and fall of tide as Quebec. It ranges from 16 to 18 feet, and possesses a power beside which that of Niagara would be dwarfed; if it could be utilized it would prove of immense advantage. It is proposed to invite eminent engineers to study the question and submit plans for its solution.

THE Electrotechnische Verein of Vienna. Austria, has decided to organize a large electrical exhibition, to be held in Vienna from May to October, 1903, to celebrate its twentieth year of existence.

It is announced that arrangements are being made at Ilfracombe for experimenting with wireless telegraphy between that town and the Mumbles, across the Bristol Channel, a distance of about 21 miles. The pole to be used is about 120 feet in height.

A LARGE manufacturing establishment will soon probably be erected in Ottawa for the manufacture of electric plants to treat garbage and sawdust so as to get all the commercial products from them. Prof. V. L. Emerson, whose experimental plant for the treatment of sawdust erected at Ottawa some time ago, was such a success, is now arranging for the manufacture of the machines in the United States and in Canada on a large scale. A feature of the work done by Mr. Emerson's machines is to take sawdust and garbage, dry it in a machine, then have it treated so as to extract the heavy oils and alcohol, etc., and continue the process until the purest results are obtained. Mr. Emerson has constructed at Ottawa a large working model of his plant capable of handling several tons a day Already a number of tests have been made at Ottawa. Scientists and capitalists have viewed the working of the machine with much satisfaction. Ordinary city garbage, it is stated, can be treated so as to secure products worth \$8 and \$9 per ton of the garbage.

THERE are 5,645 telephones established in Tokio, and there are 5,641 applications waiting to be satisfied. Of the latter 1,700 will be supplied during the present year; 2,200 may expect to get their telephones by the end of 1901, and the remainder will have to wait until 1902.

#### INDEPENDENT TELEPHONE INVEST-MENT.\*

BY HUGH DOUGHERTY.

Conclusions should not be drawn from an inspection of figures indicating profit for the present month or year, produced by subtracting operating expense from gross receipts alone.

In order to answer the very natural inquiry by the investor, and one sure to be propounded, viz, "What assurance of permanent profit at a rate not less than that indicated by your figures can you offer?"

Several things in the way of conditions, along with the figures, must be considered.

First—The necessity of the telephone service to the business world.

Second — The rate charged for exchange and toll line service.

Third—The character of construction and equipment.

Fourth—The profit and benefit to the user of the telephone, securing continued and increasing patronage.

It would seem that the knowledge that the members of this Association have of the increase of business for five years past of the independent telephone throughout the United States, would be sufficient answer to the first proposition, viz: that it is a necessity to the business world and cannot now be dispensed with any more than the telegraph or mail service.

I think all fair minded men will admit that the telephone completes the triune of business necessities, viz; the mail, the telegraph, and the telephone; the three great means of transmission of thought; the three giants that have annihilated distance.

There was a time when the mail service was not appreciated as a necessity because of a lack of knowledge of its usefulness; then messages were sent by carriers. Although we now have the telegraph and telephone through which we commit our thoughts to the care and confidence of others, yet by means of the mail we may write our letter in secret, seal it up and post it, assured that no one may know its contents, except the one who receives it.

I consider this of vital importance to the future of the race, for if love making were to cease by means of the mail, many a fellow, being too poor to pay the railroad fare to visit his best girl, would be shut out, as he would not dare to trust his love secrets to the average telegraph or telephone operator. This important feature of the mail service together with the low rate of postage insures its continuation.

The telegraph is a necessity also for quick transmission of such business when a record is necessary which may be used in the courts and for the regulation and control of the movement of railroad trains.

This insures the future use of the telegraph: while the telephone, the last but not least in the great triple alliance of contributors to the benefit, comfort and pleasure of the civilized world, takes the place, to a great extent, of both the other two, and at the same time affording many advantages possessed by neither the mail nor telegraph. This is especially true in the usefulness it has developed in aiding the transaction of business over the world's counter, where the volume of business to be

handled is great and prompt dispatch is important.

This should satisfy investors of the necessity and of the permanency of the telephone, and while there may be many inventions, such as wireless telephony, wireless telegraphy, the telegraphone, speaking tubes or some scheme of electrical signals, none of which can interfere with or disturb the usefulness of the telephone.

But on the contrary, I think that fifty years hence, as it has been in the past with the telegraph and mail service, the sphere of the telephone will be widened to an extent not dreamed of to-day, and all those who invest their money will be perfectly safe so far as permanency, stability and satisfactory profits are concerned.

In reference to the second proposition, the rate to be charged for telephone service should be such as the public can afford to pay in the locality where the investment is made.

This is only second in importance to the necessity of the independent telephone when considered by the investor. No arbitrary rate can be named for all conditions.

In this respect it is different from many other lines of business. The small country town of 1,000 or 2,000 inhabitants has many subscribers whose net profit in their business for each year is but little above the expense of living, and who are compelled to economize on all expenditures; they must therefore have a low rate.

Besides, the telephone is not as great a necessity to the smaller business as it is to the business man in the larger town or city; and yet telephone service within, to and from the village or small town is necessary to the system in order to make the investment a good one from the standpoint covering the general system of the country.

In this particular our competitor, the Bell Corporation, overlooked an important fact until they were educated to it by the success of the independent people. The exchanges in small towns must and will be managed by local people who can give them sufficient attention, after having time enough to manage other lines of business; therefore, the expense is much less in proportion than in the larger cities, since it is universally agreed by all those who have had experience in the construction and operation of telephone exchanges, that the expense per 'phone is much greater in the larger exchanges than the smaller ones.

This same thing holds good as to the management and operating expenses: so that the wise investor in telephone properties will see to it that the villages and small towns are connected up and are made a part of the system he invests in, which will add permanency and usefulness to the business, and that the rates are such that the ability of the people to pay will warrant their continued patronage.

Third—The greatest mistakes in the independent telephone field up to this time have been in the character of the construction and equipment. At the beginning of the movement so many of the appliances of electricity in the telephonic art were covered by patents that the independent manufacturers found themselves handicapped and were compelled to use devices that were crude in their nature and slow in operation. All of the important patents have expired and it is now possible to have equipment as good and even vastly superior to that in use by the Bell Company and its licensees in most of their exchanges.

The manufacturers of the independent telephone apparatus have been fully alive to the fact that to succeed the independent companies must equal and excel the service given by the old companies.

They have been alert and watchful and have put within reach of the investor the highest type of apparatus known to the telephone world at moderate cost. First cost should not be considered however by the investor even in exchanges of the smallest capacity so much as high efficiency and economical operation.

It is equally important that plans for telephone plants, either for exchanges or toll line purpose, should be made at least double the maximum capacity thought at the time to be necessary.

It has been the universal experience that the business has over-reached the rosiest estimates of the most optimistic director, and I doubt whether there is a single independent company in the country three years old that has not been compelled to enlarge its office equipment, or rebuild its leads at least once. The investor should see to it that the promoters build large and build well at the start if he wishes to keep the actual cost of his plant at the minimum figure and be attractive to capital.

Restating the fourth proposition as a question, "Is the profit and benefit to the user of the telephone great enough to insure his continued patronage?" the answer comes from the three thousand exchanges representing their one million subscribers and millions of toll line patrons who are loyal to the independent system.

One of the most important things for the person, firm or corporation who has wares for sale is to know that the purchaser will be benefited when he exchanges his money for the goods. When this is true, the article itself is the salesman and then the only question to consider is the production of the goods at a profit, and how to meet the demand for them.

It is admitted by all to whom I have talked, and who have had experience, that the demand for the independent telephone is greater than the capacity of the manufactories for its production, and the eagerness with which the new subscriber insists upon his 'phone being placed demonstrates the absolute necessity of telephone service to the business man and citizen, and discloses the cause of the marvelous growth of the independent system to such magnitude as to astound managers and investors at the unparalleled patronage reached and realized in so short a time.

All this could not have occurred unless the use of the telephone were a source of profit and benefit to the subscriber, so by the light of recent experience the investor can be at ease as to the future demand for the 'phone.

Investors who have never studied the general situation of the telephone business will be interested in the statements of the Central Union Telephone Company, which is the basis upon which they ask moneyed men to invest in their 5 per cent, bonds.

That they had increased in the number of exchanges from the year '95 to the year '95 from 133 to 193, in toll stations from 955 to 2,090, in miles of wire in toll lines from 15,088 to 43,935, in miles of poles in toll lines from 4,840 to 11,168, the number of subscribers from 32,007 to 59,810, and the net earnings from 6305,767.59 to \$527,220.81. While they have increased in the number of subscribers for the four years



<sup>\*</sup>Paper read at the Fourth Annual Convention of the Independent Telephone Association of the United States, held at Cleveland, O., June 12-14, 1980.

past about 90 per cent, their increase in net earnings is only 72 per cent.

In addition to this showing they urge as an inducement to the investors in their bonds, "that these statistics cover several periods of financial depression," and that they are particularly interesting, demonstrating as they do, how absolutely essential the telephone has become to the development of business and social interests.

In nearly two decades there has been an unbroken record of yearly increase in the net instrument output, proving conclusively, it would appear, that under the necessity of most rigorous retrenchment in other channels during a portion of these periods the telephone has been retained by the general public as an economizer of time, labor and money.

I am not here to dispute any statements made by the Central Union Telephone Company, but it is very interesting to the independent telephone people to notice this fact. that in the statistics shown by the Bell people's output of instruments, that their growth up to '94 when the independent system commenced to educate them, the Bell Company had been exceedingly slow, that fourteen years prior to '94 they had put out less than 600,000 'phones under rental to licensees, while during the five years following that they increased to nearly double that amount. This was because the independent people entered the field and forced them, as competitors, to operate in the smaller towns so that they might be able to hold their customers in the larger cities.

Six years ago there was not an independent telephone exchange in the States of Ohio, Indiana nor Illinois covering the territory where the Central Union Telephone Company now operates.

Now there are in Ohio 217 companies operating 321 exchanges with an aggregate of 47,000 subscribers and 8,500 miles of toll line, and there are in Indiana 160 exchanges with an aggregate of 25,000 subscribers and 7,000 miles of toll line, and in Illinois there are now 200 companies operating 252 exchanges with an aggregate of 30,000 subscribers and 6,000 miles of toll line.

Therefore the Independent people now have in Central Union territory 733 exchanges, 102,-000 subscribers and 21,500 miles of wire in toll lines, which excels the Central Union largely, yet they are only six years old, while the Central Union has been in business twenty years.

What is true of Obio, Indiana and Illinois is also true of nearly every other State in the Union. The independent telephone movement is of the people. It had its birth in the protest against the monopoly that claim the exclusive right to the entire telephone field of the United States and refused to occupy more than one-thirtieth of it.

The public is not unmindful of the fact that it owes everything to the men who have risked their capital and time in these telephone enterprises, and is sure to sustain them through the generous patronage because of their knowledge that the destruction of the independent telephone is their direct loss.

In fact one of the greatest securities that the telephone investments offer is the hold that the independent telephone movement has upon the people. This is not a mere sentiment, but is the outgrowth of what was a stern necessity.

The telephone business was too large to be covered by any one corporation. No one concern could own all the railroads in the community, nor all the flour mills and elevators,

nor all the real estate. Neither could one concern own all the telephones and toll lines necessary to supply the wants of all the people.

The failure of the Bell Company to do this was doubtless owing as much to their inability to do it as to their indisposition to do it. The independent companies have supplied this want. They have taken actual and substantial possession of the field. They are now much nearer the people than the other company ever could hope to be. They will stay nearer the people, because they are of the people. The man who invests his money in independent telephone property, has it very largely under his own eye.

An additional reason the independent telephone is more attractive to the investor is that the dividends paid by the American Bell Telephone Company for the year '98, amounting to \$3,882,945, was largely contributed to them by their licensees; the largest among these is the Central Union Company, covering Ohio, Indiana, Illinois, and who must contribute this amount before they are put on an equality with the independent system in their expenditures

The companies who are licensees of the Bell Telephone Company must take this extra amount off of their patrons above what the independent people charge or else their stockholders must foot the bill. This seems to me is an additional reason why the investor in the independent telephone shall feel secure as against their competitors.

No enterprise or property of any kind seems to me should be so attractive to capital and so safe an investment as the independent telephone securities.

This business has long since passed the experimental stage, and is now an acknowledged safe investment. Within the next five years, in my judgment, it will be the most highly favored local security in every community.

### AUTOMOBILES AS A SOURCE OF REVENUE FOR CENTRAL STATIONS.\*

BY ELMER A. SPERRY.

One year ago, in New York, predictions, optimistic in their general tone, were made as to the rapid and general adoption of electric road vehicles, and some disappointment has been felt by station managers that more substantial advancement toward heavy demands for current has not been forthcoming for this purpose. Managers will recall that during the year frequent inquiries have been made that have not resulted in desirable business.

It is my purpose to outline briefly some of the factors that have contributed to these unfavorable conditions, and to record some advances made. It has been discovered in many instances that the demand for current is not so favorably located on the load curve or on the network as was hoped; for instance, electric delivery wagons required charge at times of heavy load, and on the part of the network heavily taxed in lighting. Again, the factors controlling the seasons of the heavy demand for lighting during the year are found identical and in phase with those requiring heavy duty of commercial electric vehicles. The carriage of the shopper and the delivery vans are both more active at these seasons; furthermore, the same weather conditions producing heavy traction at the same time, increases the demand for light. In a word, the diversity factor that it

\* Paper read at the Twenty-third Convention of the National Electric Light Association, Chicago, Ill., May 22-24, 1900.

was hoped would be introduced with the automobile, has not been in evidence.

Many of these difficulties may be made to disappear entirely, and the diversity factor be developed that is practically ideal, by the simple device of duplicating the traction batteries. Where this has been done, it has been found that the charging can go forward at times and rates dictated by the station, and practically under its control. No hardships need be experienced by rigid conformance with this practice. Careless infringement of this principle may be remedied in a number of ways; the employment of two-rate meters has been suggested in this connection.

The station management has not in all instances been able to conceal disappointment at the unfavorable developments along some of the lines above pointed out and has allowed it to react back to inquiring parties. I regret to say that prospective customers have in cases been embarrassed by want of co-operation, aid and enthusiasm, justly expected from the management. Opportunities have thus been lost to encourage the industry, as the results that are now assured amply justify, as I shall endeavor to show.

Mechanical traction is coming rapidly to the front; animal power is being superseded on every hand, and, especially for commercial uses, a universal effort is being made to break away from the horse and place roadwork on a mechanical basis. As a source of power, the mechanical is found to be simpler, more reliable, and shrouded in far less mystery than the cellular-tissue-nerve combination. It should not be out of place, before this body, to recall some of the evident merits and advantages of the electric over other automobile systems. The perfect storage battery presents some remarkable features; it even rivals the electric motor itself in its fitness and special adaptability to the automobile problem. Its very large reserve power at instant command; its entire freedom from danger when fully charged; its almost constant pressure throughout its capacity-mark its superiority. This straight line of discharge of the battery is not matched by any other power-storage system of which we have knowledge. The recently developed capacity for quick charging, and the ease with which the charge may be obtained in almost any hamlet in the country, are among its advantages.

It has long been supposed that compressed air is an ideal form of stored power, but it is safe to say that electric storage distances compressed air in all the important features. Reliable batteries are now available and on the market that will yield for each hundred pounds 1.8 horse-power hours. Compressed air will yield to every hundred pounds (air and tank exclusive of reheater) three-tenths horsepower hour; or six times the power for electric that it is possible to obtain from air. This result will be a surprise to some engineers. The fact that with the electric system we have a rotary motor of ideal simplicity, with a capacity for overload coupled with an efficiency that is nothing short of wonderful, contributes inestimably to the success of electric-motordriven systems, and is in marked contrast to the multiplicity of compounded, reciprocating engines employed as motors by our compressed air friends.

The single feature of constantly increasing cost of supply of fuel-using vehicles has already driven the makers to the extremity of seriously considering alcohol, with its weak



power factor, as a possible substitute for the lighter petroleum products. The thoughtful engineer is constantly confronted with conditions indicating that in the realm of power coal is king, and only those traction systems that are organized to derive power from this source will keep to the front. This point, coupled with the electric system, is responsible for the stupendous development in present urban or street traffic; to show its superiority over all other powers, one needs only recall the total absence of either steam or gasoline street cars. Germane to this subject, the question is often asked, will autos replace street cars? Its great flexibility and independence of track certainly render the new claimant an ideal urban conveyance. Can the central-station man look forward to supplying so large a demand as would thus be created?

The automobile under street car conditions brings forward an interesting field of inquiry. The single fact that the stupendous cost of permanent way and its maintenance is at once eliminated makes the problem of more than ordinary importance. The interest and income on these two items would yield so large a sum as easily to off-set much extra expense of operation, and especially expense attending the development and smoothing out of the early working, and covering the expense of adjusting a system of this magnitude to new conditions. Such a system would, however, be subject to certain limitations, chief among which will be found decreased weight per passenger, difficulty of easily directing the excessively heavy structure, large increase in power per passenger carried, increased rolling friction factor, and-one of the most important-the limitation as to roadbed, soft tires being precluded by the excessive tonnage. Considering these factors separately and collectively, the point is at once reached, showing conclusively that with anything like wheel pressures equal to that now obtaining in street-railway service. nothing but steel pavement could be practically employed. To demonstrate this matter, tests were made as follows: Asphalt roadbed was taken as the standard roadbed of the future. A piece of very hard asphaltum, laid in the most approved manner, and in constant use for two years, was selected. This had been maintained at an average temperature of thirty-eight degrees for eighteen hours (no sun), the highest temperature during this time being forty-six degrees at time of test. A sixtytwo inch wheel with three and one-half inch steel tire was loaded to 5,000 pounds on scale. This wheel was taken over various parts of the hard asphaltum with the following results: Once over, average depression .029 inch; twice over, average depression .047 inch. These depths were taken by a micrometer, depth gauge easily reading to one-fifth of a thousandth of an inch, and some thirty readings were taken in each instance. It will be noticed that this depression is somewhat over one and one-half thirty seconds of an inch. The amount of this depression is surprising. considering the comparatively light load, broad tire, large wheel, extremely firm condition of the roadbed, and the temperature at which the asphaltum was tested, and seems to bear out the statement that the real limitations are probably more those of roadbed than of any other one factor.

Another factor destined greatly to increase the radius of action of electric vehicles, and the consequent demand for power, is roadway improvement. The present good-roads agitation is certainly in line of progress, and should be given all possible aid and encouragement. In this connection, I see no reason why we could not wisely follow the plan, based on historical precedent, of utilizing for this important work of permanent improvement our convict labor, the disposition of which in this country has always been a source of embarrassment to the authorities. This system certainly has much to recommend it, and the improvement of our roadways calls for a vast expenditure of labor and has much need of a uniform and systematic effort.

The fact remains, and has been emphasized within the past year, that progress in electric vehicles has not been as rapid as was expected, and causes have existed that were not before seen and were not generally understood. Some vital reason seems to have prevented the rapid development and general adoption that at one time seemed assured. Was it the element of cost? Two important conditions stand out prominently in connection with electric road vehicles, these are first cost and cost per mile of operation. It is not my purpose to discuss the first, as there are endless variables entering into the question, and it is doubtless true that the prices will gradually decrease. This part of the problem is always found to be selfcorrecting, and even to-day, with the electric, the cost per pound of vehicle complete is lower than other and far less available and pleasurable systems.

The cost of electric power for automobiles has deen demonstrated in Paris to be less than with any other power system, and surely this factor is not the one now preventing the wide adoption of electric vehicles. In a paper before the American Institute of Electrical Engineers, G. F. Sever and R. A. Fliess, of Columbia University, give results of extended trials with electric delivery service in New York City. It is shown that with present power and rolling friction factors there is effected a saving of nearly two and one-half cents per car mile over horse service; and with the capacity of many more miles per day than with horses. With a daily service of thirty-six miles, a saving of 356 hours per year of actual delivery service per vehicle is effected. The average horse was found to have a capacity for three hours' work per day at the rate of seven miles per hour. The authors state: "The figures given above speak for themselves, and would appear to be most effective argument in favor of adopting electric automobile delivery service."

A popular notion exists that carriage batteries and electric batteries are charged with a certain number of miles. It requires only a second thought to see the error and delusion embodied in this idea. It is evident that a battery when fully charged contains not miles but electrical power, which may be expressed in horse power, and which is proportional to the size and capacity of the particular battery in question. With this in mind, it will be readily seen that the statement that carriage batteries contain a capacity to run a given number of miles would only be true when a certain standard pavement or roadbed is considered, because it is found that it requires very much more battery power to drive a carriage a mile on a soft, uneven and hilly road than it requires on a smooth, hard and level road. It should always be understood that a standard pavement or roadbed is considered.

Again, for instance, where two motors are employed the power and efficiency is divided,

requiring, it is found, a larger amount of power from the battery to drive a vehicle of given weight a mile upon standard road; again, the mechanical condition of the bearings, or amount of rolling friction present in carriages of different makes also varies. It is evident, therefore, that a number of important considerations should be included in any attempt to give a definite or prescribed mileage capacity to electrical vehicles and their batteries.

(To be continued.)

#### THE DEVELOPMENT OF THE TELE-PHONE \*

BY ED. L. BARBER.

In responding to the invitation of the committee to make an address on "The Development of the Telephone," I find myself in a number of difficulties, one of which is the committee failing to suggest just at what point in the history of the human race I was expected to begin my disquisition on the subject. There was great danger of my starting in several centuries back and gracefully sliding down the "Rock of Ages" until I struck the threshold of the twentieth century, but I wrestled hard with the temptation, and I believe better judgment has prevailed, so omitting all reference to the crude apparatus which is said to have been used by the semi-civilized denizens of the Orient centuries ago, passing over the pair of tomato cans or baking powder boxes and string attachments which, as boys, we used to communicate from the barn or wagon shed to the house, I will plunge into the telephone as it comes within the memory of the youngest of my auditors.

The telephone as we know it, to-day is a product of the last quarter of a century. When first placed upon the market, few people had the slightest idea of the important part it would play in the business and social life of the people. It was generally considered but little better than a toy, and for a number of years subsequent to the granting of the patents covering its important features it did not come into anything like general use. As soon as its utility was recognized it passed into the hands of a corporation, which waxed wealthy and grew corpulent from the money exacted from those who were, perforce, compelled to pay whatever sum was demanded for the service. During the time this state of affairs existed, or up to the year 1895 when the independent movement was fairly started, there were comparatively but few telephones in use, the monopoly believing the telephone to be a luxury, and for the few, charging such rates that it was impossible for the many who desired to indulge, but in this year, when several of the basic patents expired, so that whoever desired could both manufacture and use the telephone, then was recorded the birth of the independent telephone organization, which has grown to such magnificent proportions as to cause the assembling of such a Convention from the four corners of this vast country as we are here enjoying.

Then it was discovered that just as good, if not better, apparatus could be manufactured by the independents as was in use by the monopoly, and factories were started, at first only two or three, but as the demand increased more were added, until now there are some fifty or more in the manufacture of telephones and

<sup>\*</sup> Paper read at the Fourth Annual Convention of the Independent Telephone Association of the United States at Cleveland, O., June 12-14, 1900.



switchboards alone, to say nothing of the many other branches of the industry, and I am told by the people of this branch of the industry, that the demand for their goods is increasing so rapidly that it is almost impossible for them to supply it.

At the time of the advent of the independent movement had those who were in possession of the telephone interests of this country been disposed to be half way fair with the people, the independent telephone movement would never have been born, and those of us who are here assembled to-day would never have had the pleasure of communing with each other, nor the experiences we have had since we engaged in this line of human endeavor. But they were not so disposed. They seemed to believe that they had everything their own way, that the telephone was invented only for the rich of the populous centers of our country, and by their acts of exclusion deprived nine-tenths of the population of our country the privilege of enjoying this greatest of modern improvements. The man of moderate means could not afford to pay the exorbitant prices charged, and even those of wealth, who could afford it, but who chanced to live outside the larger cities, were likewise denied the boon they sought.

The advent of the independent telephone movement, however, changed all this, and within the past five years this movement has taken such strides that nearly every village of the land is connected with the great outside world by one or more telephone lines, and the homes of multiplied thousands of those residing on farms far distant from the centers of population enjoy the same benefits on this line as do their heretofore more favored city cousins. The telephone is no longer a luxury to be enjoyed only by the rich, or those whose business interests compelled them to pay whatever price the monopoly demanded for its service, but it has become an everyday necessity in both the home and the business office, almost as necessary to the home as the cook-stove, and as essential to the business office as a desk or typewriting machine. All this has been brought about by the movement which we represent, and there are some of us here who are vain enough to think that we have had something to do with the shaping of this most desirable result.

Again, to refer to the apparatus we use. When the first independent exchange was constructed, the monopoly laughed long and loud, and indeed there was some reason for their hilarity. The apparatus used was crude and it was inefficient, all of the basic patents had not expired, and the earliest independent exchanges were compelled to use instruments without a battery attachment, and it was soon discovered that such equipment was inadequate and could not fill the bill. But the day came when the last of the patents ceased to be prohibitive, and then the monopoly changed its tune, and has been changing it until to day it is a most dismal dirge that is wafted over the land from the scene of previous rejoicing down on Milk street in "Old Boston Town."

To-day we surpass them in the number of exchanges in operation and in the number of points reached, and in the territory between the Alleghany and Rocky Mountains in the number of instruments in use, and have an equipment in every respect superior to that used by the monopoly, and they are taking lessons from us in the construction of telephone plants.

Our instruments (I do not refer to any particular manufacturer's output, for there are a large number of really excellent instruments on the market to-day, made by as many different houses) are fine specimens of mechanical skill and workmanship, and fulfill to the letter all the demands made by an exacting public upon them, and are to-day giving better service in a thousand towns and cities throughout this broad land than are the instruments of that monopoly which has repeatedly informed the people that we do not know how to build telephone plants, do not know how to operate them, and are unable to secure either telephones or switchboards which will stand the test of service.

But the people have learned some important lessons along the telephonic lines during the four years which are covered by the history of this independent movement. They have learned that we are their friends and that whatever we tell them they can rely upon, while the wild statements of our adversaries have been, time and again, proven false. They have learned that if they want the best service, the most accommodating service, they must come to us, and that it is to our efforts that must be credited the fair prices that predominate, and that to us belongs the credit of making the telephone what it is to-day — a blessing to all the people everywhere.

Now a word as to statistics in the movement. I think most of us are familiar with what was done up to the meeting of our Association last June in Chicago. To-day we have, as nearly as I am able to ascertain, about 3,000 exchanges with a total number of 1,000,000 telephones and many thousand miles of toll line. so you see we have increased even more rapidly than in any previous year and that the independent development of the telephone is by no means at a standstill. Since we have thus succeeded, my idea is that we should still continue the same policy, continue to avoid the mistaken idea of the original company that the telephone was for the few, to give the best possible service at the least possible cost, to avail ourselves of a practically unlimited demand, and to so conduct our affairs, that our patrons will regard our interests and theirs as identical and equally deserving of consideration. Even now the use of the telephone is in its infancy when we consider what has been done in the past few years. Its growth has only begun. Ultimately the telephone will be in every home as a convenience, a time and money saver, and a "necessity" in the ordinary affairs of men.

#### THE 3,000-VOLT THREE-PHASE RAIL-WAY AT COLICO, ITALY.\*

BY E. K. SCOTT.

From an electrical novelty point of view probably the most interesting exhibit at the Paris Exhibition will be the plans, details of the electric cars, etc., for the 65 miles of electric railway which the Adriatic Railway Company are laying down at Colico, Italy, the bare conductors from which the trains draw their energy being worked at a pressure of 3,000 volts.

The objects to be exhibited include details of the line equipment, models of a transformer sub-station and a parlor motor carriage of 300 hp., besides switches and other details. These will be exhibited in a pavilion which is being specially built by the Adriatic Railway Company, and which will be ready by the end of July. The line itself will not be ready for use before the end of 1901, but Messrs. Ganz & Co. erected some six months ago an experimental line of 1.6 kilometers at Buda-Pesth on which all the details are being carefully worked out.

The lines being converted are those of Lecco Colico, Colico-Sondrio, and Colico-Chiavenna, which are at present worked by steam.

The necessary power will be derived from a 98-foot fall on the River Adda; the head race is three miles long, and at the power station at Morbegno (10 miles from Colico) 10,000 h.p. will be available. It is proposed to erect three units of 2,000 hp. each, consisting of turbines and Ganz three-phase alternators, generating current at a pressure of 20,000 volts and 15 periods per second.

At intervals of about 61 miles there will be 10 transforming stations, reducing the pressure to 3,000 volts on the trolley wires, which are 8 mm. in diameter. Both the primary and secondary lines are on the same poles, except in the tunnels where the lines are fixed to the The two overhead wires are three feet apart and the rails form the third conductor. The passenger motor cars are to have four motors, each 150 h.p. Two motors only will be in circuit at the maximum speed of 38 miles an hour, the other two being thrown into circuit when the train of 65 tons weight ascends gradients of above 1 in 100 at 19 miles per hour. When the four motors are, in use, two of them take current, not from the trolleys, but from the other two motors; in this way it is said that the speed is reduced to one-half without loss of energy. There are to be five passenger trains and two freight trains, the freight trains being run at about half the above speeds and having a maximum capacity of 200 tons, they are hauled by a 600 h.p. locomotive.

The whole of the line is divided into single parts, each of which is supplied with current from the sub-station next beyond it, this being done to ensure greater safety in working. When one block signal indicates "stop," the next part of the line is not supplied with current, and in case of interruption of current the Westinghouse brake comes on automatically, an important feature on a line with steep grades.

This line is of international importance, because the Adriatic Railway Company is one of the two largest railway concerns in Italy, controlling as it does the whole of the railway network down the eastern portion of the kingdom.

The decision to undertake the work is the direct result of the successful operation of a short length of electric railway from Milan to Monza, and it is further interesting to note that the company are so pleased with the way things are shaping that they already contemplate equipping electrically the Bologna Firenze line, which is several hundred miles long, and crosses the highest points of the Appenine range of mountains.

The Mediterranean Company, who control the railway system on the west of Italy, are following suit, and have already obtained the royal decree to a project which will require 10,500 hp. Electrical engineers, and also railway engineers, will therefore need to watch these Italian developments closely, for as was the case with the Tivoli Rome transmission. it is again falling to Italy to give the engineering world a lead.

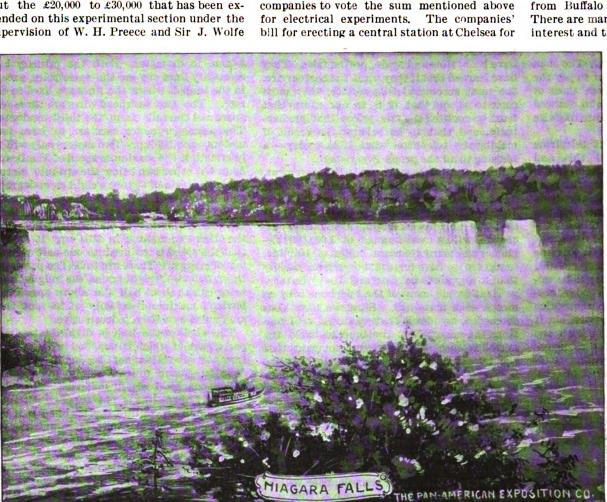
<sup>•</sup> From the "Electrical Review." London.

#### LONDON NOTES.

[From our London Correspondent.]

#### Opening of London Underground Electric Lines.

There was a press inspection of the electrical section of the Metropolitan Underground Railway between Earl's Court and High street, Kensington, on the 18th, and the train was to be brought into regular service along with the steam trains running over the same line three days later. This electrical section, which is about a mile long, has been equipped without in the least interfering with the existing line. The gradients encountered are heavier than on any other part of the railway. It has been stated from the first that these experiments were absolutely necessary before the conversion of the entire line to electrical working, but the £20,000 to £30,000 that has been expended on this experimental section under the supervision of W. H. Preece and Sir J. Wolfe and the introduction of fans, but these have failed to remedy the evil. Ordinary locomotives fitted with condensers were adopted, and in the first instance the fuel used was coke, but subsequently it was found necessary to resort to coal, and that is the fuel now employed over all the line except this one mile electrical section. About three years ago the state of the tunnels in the matter of want of ventilation inclined the Board of Trade to appoint a special committee to thoroughly investigate the question. Their report made a most elaborate document of over 150 pages of expert and other evidence pointing to the adoption of electrical working as the only effectual remedy for the nuisance. The recommendations of that committee required immediate steps to be taken within a certain time for electrical working, and this is really what led the two companies to vote the sum mentioned above



Barry is looked upon as unnecessary expenditure because electric traction was bound to come on this choky railway. However, the experts will doubtless observe certain things from these experiments which will aid them in carrying out the conversion of the entire line. The train was built by Messrs, Brown Marshalls of Birmingham, and the electrical equipment for it, the track and the temporary power house was supplied by the Siemens Bros. Co. It is perhaps of interest to mention that this railway, which has gone dividendless so far as its ordinary stock is concerned for about 20 years, was originally intended to be worked by hot-water locomotives, and this fact accounts for no provision being made for ventilation. The hot water experiments made before the line was quite completed proved a failure and this idea was abandoned. At certain intervals more or less elaborate works have been carried out in the way of new openings, the operation of the whole system by electricity is now waiting for Parliamentary sanction.

The new train weighs 180 tons, which includes 54 tons for a motor carriage at each end of the train, and 18 tons per coach.

The Central London Railway is now completed and the generating plant and trains have been undergoing trial runs. In a few days now the opening of the line will be announced. The trains on this line will weigh only 150 tons.

THE water of the Flint Creek Falls in Anaconda, Mont., has been completely harnessed and is now running the Bi-Metallic and Granite Mountain silver mines and mills at Granite and Phillipsburg in that State by electricity. The electric light plant is situated at the foot of the falls and between seven and eight miles on an air line from the Bi-Metallic mill at Phillipsburg.

### A GREAT AUXILIARY ATTRACTION TO THE PAN-AMERICAN EXPOSITION.

The importance of the great Falls, Rapids and Gorge of the Niagara River as auxiliaries to the many and varied attractions of the Pan-American Exposition to be held in Buffalo, May 1 to Nov. 1, 1901, cannot well be overestimated. In its immense flow of waters, its grand scenery and its historic lore, the Niagara is one of the most renowned rivers of the world. Its great cataract has defied the descriptive powers of poets and philosophers and baffled the delineative skill of painters and photographers. The grandeur of their environment renders the Falls perennially interesting at all seasons of the year and very few of those who visit the Pan-American Exposition but will desire also to visit them. The trip from Buffalo can be made in half an hour. There are many points of view and places of interest and the visitor can plan his itinerary

> according to the leisure time at his disposal. If time will permit, the cataract should be viewed from both sides of the river and trips should be made the length of the Gorge, either along the cliffs above or over the trolley road which runs close to the water's edge. Perhaps the most comprehensive near-views of the Falls are those obtained on the Canadian side of the Gorge, especially that from Falls View station. Here is a complete panorama, embracing the rushing and turbulent currents of the upper rapids and the whole sweep of the falling waters, reaching from end to end nearly four-fifths of a mile, with the great Horseshoe Fall in the foreground separated by Goat Island from the American Fall, which is 158 feet high, and 1,881 feet wide. In the river below plies the little steamer "The Maid of the Mist," carrying visitors close to the foot of the Falls at various points and affording splendid views of the descending waters. The State Reservation on the American side and Queen Victoria Park, across the river in Canada, are delight-

ful observation grounds, both open for the enjoyment of the public free of any charge. To the scientific visitor the electrical power development at the Falls will be especially interesting. On the American side there are two great corporations utilizing the current of the Niagara River for developing electric power used in many industries at the Falls. The power thus generated by one of these corporations is also transmitted to Buffalo, 25 miles distant, for use for the electric lighting of the city, for operating a great electric trolley car system and in many important manufacturing establishments. The power thus transmitted will likewise be extensively used for the purpose of the Exposition.

#### THE AGRICULTURAL BUILDING.

The agricultural industry will have a fitting setting at the Pan-American Exposition. A commodious and richly proportioned building will be devoted exclusively to the interests of

the farm. So wonderful has been the development of agriculture and so marvelously has the productivity of soils been increased by the application of scientific methods it is no exaggeration to say that, potentially, the cultivated acreage of the world has been doubled within a few years. Science has indeed made two blades of grass to grow where but one grew before. More than that, it has, by irrigation, made the deserts to blossom as the rose.

The Agricultural Building will stand opposite the Manufactures and Liberal Arts Building on the north side of the Mall, its longest facades looking to the north and south. On the east will be the live stock exhibit, to which about ten acres are devoted. Northward will be the Stadium covering another ten acres. On the west is the Grand Court with the Electric Tower, 348 feet high, and the Electricity Building just beyond. There are four broad entrances to the building. Opposite the north-

ern entrance is an artistic bridge crossing the Grand Canal. Vaulted loggias connect the east and west entrance with the main entrance on the south, and from these elevated promenades the people may view the throng of sightseers upon the Mall. The low tiled roof overhangs the walls eight feet, making a deep shadow over the richly decorated cornice. The lattice is fastened to the dome, ceiling and walls, then, on a background of blue, grapevines produce the effect of looking through to the open air. The southern entrance, 30 feet wide, is flanked on both sides by large groups of statuary. Above

the doors and following the lines of the arch, panels will be painted to represent the signs of the zodiac. On either side of the vestibule are large niches affording places of rest and retreat from the crowds. On either side of the south entrance at the intersection of the eaves of the loggia are large consoles surmounted by figures representing the "Sower" and "Reaper." The Agricultural Building is 150 by 500 feet, and contains exposition space to the amount of about 75,000 square feet.

#### PARIS LETTER.

(Special Correspondence of Electricity.)

### Elevators and Elevating Inclines at the Exposition.

There are twenty-seven inclined rolling elevators in operation at diverse places in the Exposition, twenty are to be found on the Champ de Mars and seven at the Invalides. The Plat Company has installed seventeen of the Hallé system in Paris at the Magazines du Louvre and five others have been placed by M. Jules Le Blanc, while a like number were put up by the old Cail establishment, which is, strictly speaking, the French Society of Mechanical Constructors. I will describe the details of their construction later. As to elevators, all systems are represented, only five of them are operated electrically on the Champ de Mars. Two were built by Stiegler, and one each By Messrs. Gallois, Rousseau-Lecoq and Mocomble.

#### Moving Sidewalk and Electric Railway.

The moving sidewalk, which has been adopted by the Exposition authorities, is the pro-

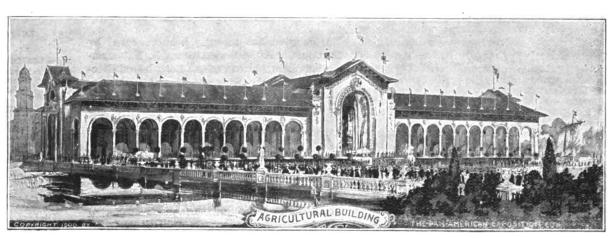
ject of Messrs. Blot, Guyenet and Mocomble, and was built by the Compagnie de Transports Electriques on the Exposition grounds. This firm also operates at the same time the electric railroad; the route is practically the same as that of the moving sidewalk. The latter is 3,400 meters long and starts from a point on the Bourdonnais avenue in the Exposition grounds. It follows this avenue through the Exposition grounds and passes outside via the Motte-Picquet avenue, as far as the Esplanade de Invalides. It moves along inside the latter enclosure of the Invalides and follows the Fabert road, passing near the railway station at the Invalides, and then follows the Quai d'Orsay as far as the Champ de Mars, returning to its starting point on the Bourdonnais avenue, thus making a continuous circuit but running in an opposite direction to the electric railway. These two routes form a closed circuit and there are nine stations along the

platform by means of a driving gear connected to the differential gears.

The electric energy for operating both the platforms and the electric railway is generated at the Moulineaux station of the General Traction Company, which contains three-phase alternating Westinghouse generators of 800 kilowatts each. These three-phase currents are of 3,000 volts and are carried by primary mains to a transformer station located on the Quaid Orsay at the corner of the Bourdonnais avenue. There are two groups of rotary transformers in this station, of 600 kilowatts capacity each, also commutating machines of like power.

The secondary system of distribution is in cable form and laid underground. The cable section is 100 square millimeters and it is fed from six copper bus bars of  $33 \times 8$  mils.

The electric railway is also a belt line and runs parallel to the moving platform, some-



THE AGRICULTURAL BUILDING, PAN-AMERICAN EXPOSITION.

routes of steel construction with stairways.

The moving platforms are composed of two moving sidewalks, each going in the same direction but at a differential rate of speed of four and eight kilometers. These two parallel sidewalks are supported by an iron framework rigidly supported on wooden timbers with their bases deeply embedded in a solid foundation. These supports are placed from 9 to 15 The distances vary with meters apart. the local conditions of the route, and they carry stringers composed of T-iron trellis work, joined by bridging cross beams fastened by means of bracket supports. Upon this framework is placed the integral part of the platform, which is composed of sections of covered four wheel trucks, boxed in and all joined together.

Motion is transmitted to the wheels of the moving platform through an axial shaft placed alongside of the axles of each truck and underneath the truck covering. Each of these axial shafts are connected to the preceding one on the next truck by a hinged joint connection to allow of perfect freedom in rounding curves.

The moving mechanism is composed of a series of wheels and axles operated by an electric motor placed between the rails of the fast moving platform. A coupling shaft with a universal joint is geared to the fast moving platform and directly operates the low speed platform. The diameter of the gear wheels on this coupling shaft are in proportion of two to one (0.70 and 0.35 meters in diameter). There are 175 electric motors of 5 hp. each, connected in series and operated by a continuous current of 500 to 525 volts at a speed of of 725 revolutions per minute, which operates the moving

times close to it and at other locations a little below. Near the Alma bridge the track runs underground and also passes under the bridge of the Invalides through a viaduct. The minimum radial curvature is 40 meters and the average grade is four millimeters per meter. The gauge is one meter and the rails weigh 27 kilograms per meter and are of the Vignole The current is taken from a lateral third rail of the same type as the track rails; it is supported on porcelain insulators placed near the extremities of the ties. The rail joints of the third rail are bonded by means of copper bonds fastened to the web by means of copper rivets. These bonds also subserve the purpose of fish plates. Each train is composed of a motor car with two trailers, and has a carrying capacity of 205 passengers, with seating capacity of 110 and standing capacity of 95. The total length of the train is 30 meters. Its weight empty is 18 tons. The motor cars are 12 meters long and the motive power is four Westinghouse generators of 31 hp. each. The motor cars have a carrying capacity of 82 passengers, 46 seated, 36 standing. The ordinary cars are 8.30 meters long with a seating capacity for 62. All of these cars are furnished with two sets of brakes, a common hand brake and a compressed air brake. The total equipment in service comprises seven trains with a total of twenty-one cars, seven being motor cars. The trains follow each other under a headway of 90 seconds, making forty trains an hour. The speed is 17 kilometers per hour and there are five stations along the route.

This electric railway has only been in service for a few days. The moving platfor:n has already had several interruptions in its service.

The circuits have had accidents happen to them, and once the trucks ran off the rails and it took several hours work to replace them. The principal danger that exists and which has been difficult to overcome is a short circuit that readily sets fire to the woodwork of the road and to the moving platforms. Let us hope that this accident will not occur again.

#### CANADIAN NOTES.

Considerable comment is said to have been caused in Montreal municipal circles by the application from the Montreal Terminal Railway (the old Belt Line) to continue its service through the city. The application was referred to the road committee of the city council, and will probably be resisted by the Electric Street Railway Company on the ground, frequently urged heretofore, that the granting of such permission as that requested, would be a violation of the contract between the company and the city. However, legal opinions have been given to the effect that under its contract, the Street Railway Company has no monopoly of the city streets. It appears that if the Terminal Company obtains the desired permission, it will construct one or two electric car lines from one end of the city of Montreal to the other, connecting with its suburban system in the east end of the island. Some time ago this company endeavored to make arrangements with the railway company to run Belt Line cars to the center of the city or to lease special cars of its own connecting the Belt Line suburban service with the center of the city. This being refused, the Terminal Company now seeks to build city lines of its own, as it is empowered to do under its character from the Dominion Parliament. The proposal meets with much favor as it will provide a useful competion in the other transmission. tion in the street car service.

The council for the town of Hespeler, Ont., has passed a by-law to raise \$10,000 by debentures for the purpose of taking over the Shantz electric light plant in operation in that town.

The Standard Electric Light Company has . been organized at Napance, Ont., and has taken over the electric light and power business of Mr. J. R. Scott of Napanee. It is understood that the extension of the plant is under consideration.

Messrs. Dean & Shibley, bankers, of Napanee, Ont., are negotiating for the purchase of the interests of the Trenton & Belleville Electric Water Power Company, the Belleville Gas Works, and the Belleville Electric Street Rail-way. If secured, it is the intention to extend the railway, and to make improvements to the lighting and power plants.

#### Proposals Invited.

The War Department, through the Corps of Engineers, is inviting sealed proposals until July 18, for furnishing a quantity of electrical supplies, such as C-S switches and switchboxes, porcelain cut-outs, iron armored conduit, and flexible iron conduit. Full information will be furnished upon application to Lieut. John S. Sewell, Washington, D. C.

#### Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended June 23:

Antwerp, 73 packages, \$2,974; Australia, 182 packages, \$7,347; 1 case, \$21: Barcelona, 2 cases, \$166; Brazil, 41 cases, \$4,124; Bristol, 13 cases, \$3,000; British Possessions in Africa, 109 packages, \$2,975; British West Indies, 19 cases, \$272; British Guiana, 6 cases; \$456; Central

America, 34 cases, \$540; Chili, 29 packages, \$1,049; 3 cases, \$17; Christiania, 105 packages electric motors, \$2,300; Cuba, 58 boxes, \$2,215; Dutch West Indies. 1 package, \$19; Glasgow, 3 packages, \$10,000; Hamburg, 83 packages, \$8,121; 7 cases electric instruments, \$10,100; Havre, 2 cases, \$215; 150 packages, \$5,842; 1 electric motor, \$500; 2 cases, locomotive parts, \$25,003; 4 cases automobiles, \$4,000; Hong Kong, 10 packages, \$291; 5 cases, \$318; Leeds, 1 package, \$125; Liverpool, 169 packages, \$27,956; London, 243 packages, \$13,424; 3 cases, \$55; Mexico, 51 packages, \$812; 2 automobiles, \$900; New Castle, 29 packages, \$2,800; 2 cases, \$115; Peru, 22 cases, \$973; Porto Rico, 40 cases, \$4,098; Rotterdam, 6 packages, \$174; Southampton, 6 packages, \$90; Stettin, 57 cases electric fans, \$2,193; St. Petersburg, 1 case, 503; 1 package, \$153; U.S. Colombia, 6 packages, \$193; 12 cases, \$2,146; Venezuela, 63 packages, \$190.

#### LEGAL NOTES.

A decision has recently been rendered by the Court of Appeals at Albany, N. Y., affirming judgment in favor of the Long Island Electric Railroad Company and the National Express Company against which Aaron De Grauw brought suit. The question decided in the affirmative involved the right of surface roads to operate freight and express cars over their tracks under their charters.

The Canadian Electropoise Company of Toronto is a party defendant in a suit for \$10,000 damages instituted in the Exchequer Court of Canada. The plaintiff is the Aminarium Company of New York, and the action is one in which the priority of a patent on an electrical cure-all appliance is at issue. The American company received the idea from Dr. Hercules Sanche, of Montreal, three years ago, and it is claimed that the Canadian company and another of the same name in New York have since applied it to their own electrica appli-

Vice-Chancellor Grey of Trenton, N. J., rendered his opinion a short time ago in the application for preliminary injunctions against the Camden & Trenton Railway Company, which were filed by Harry S. Ehret and Mary N. Baldwin, both of Beverly. The vice-Chancellor refused to grant the injunctions and dismissed the order to show cause.

#### PERSONAL MENTION.

Dr. Perrine of the Stanley Company and F. W. Roebling left Springfield, Mass., this week for a business trip to the West. It is said the object will be to effect an amalgamation of the Stanley and a Western Electric Company making direct current machinery.

Mr. McVay, city electrician of Wichita, Kan., writes that he will arrive in New York about the middle of July to join the representatives of the American Institute of Electrical Engineers who will visit the Paris Exposition.

#### INCORPORATIONS.

The Akron Electrical Company. Akron, O. Capital stock, \$48,000. Incorporators: Edwin E. Andrews, of Akron, and

The Pittsburg Electrical and Machine Works, Pittsburg, Pa. Capital stock, \$60,000.

The Electric Light & Heat Company, Old Forge. Pa-to furnish light, heat and power. Capital stock, \$10,000. Incorporators: T. B. Jones, T. Pickrell, J. Surber, all of Old Forge; I. F. Price of Moosic, Pa., and W. H. Nalor of Dur-

The United Storage Battery Company, Jersey City, N. J. -to supply electric motive power. Capital stock, \$500,000 Incorporators: Albert W. Stringham and Frank Miller, Brooklyn; P. Andrew Hohn, Hoboken; Alexis C. Fern and Owen T. Bugg, New York.

The Central Electric Company, Newark, N. J .- to furnish electric light, heat and power. Capital stock, \$100,000. Incorporators: P. H. Jackson, D. Farrand, V. H. McCarter. A. Riker and L. D. H. Gilmour, all of Newark.

The Bristol Electric Light Company, Midland, Mich. Capital stock, \$10,000.

The Ferris Electric Company, Farmington, Ill.-to operate us, steam, electric and telephone plants. Capital stock, \$10.000. Incorporators: W. J. Ferris, J. Scribner and T. Ferris all of Farmington.

#### ELECTRICAL PATENT RECORD.

This department is edited by OSCAR A. MICHEL. Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway. New York City, N. Y., or 659 F street, N.W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.

#### LETTERS PATENT ISSUED JUNE 19, 1900.

#### ELECTRIC RAILWAYS AND APPLIANCES.

652,003. Electric Railway. William Kingsland, London, Eng. Filed Sept. 8, 1899.
 652,039. Trolley. George W. Perry, Peoria, Ill. Filed Feb. 6, 1900.

#### ELECTRIC LIGHTS AND APPLIANCES.

- ELECTRIC LIGHTS AND APPLIANCES.

  651,866. Incandescent Lamp. Isidor Kitsee, Philadelphia, Pa. Filed March 2, 1900.

  651,985. Electric-Arc Lamp. Allyn B. Walton, Lorain, O. assignor to the National Vapor Stove & Manufacturing Company, same place. Filed Dec. 21, 1899.

  652,194. Electrical Incandescent Lamp. Max von Recklinghausen and Adolf Vogt, London, Eng., assignors to the Nernst Electric Light, Limited, same place. Filed Nov. 6, 1899.

#### ELECTRICAL MACHINERY AND APPARATUS.

- 651,909. Electric Motor. Henry O. White, Boston, Mass. Filed Oct. 18, 1899.
  651,945. Electric Motor. Clifton L. Bundy, Philadelphia, Pa. Filed June 6, 1898.
  652,116. Rheostat. Thomas F. Jordan, New York City. Filed March 20, 1900.
  652,151. Automatic Electric Switch. Phill S. Tirrill, Groveton, N. H., assignor of one-half to Fred W. McDonald, same place. Filed Sept. 23, 1899.

#### TELEPHONES AND TELEPHONE APPARATUS.

- 651,817. Telephone Toll Apparatus. John T. Belanger, Detroit, Mich., assignor of one-half to Frank H. Clarke, same place. Filed Nov. 20, 1899.
  652,084. Hotel Annunciator System. Clayton B. Clark, Sing Sing, N. Y., assignor to the Clark Electrical Company, same place. Filed June 20, 1899.

#### MISCELLANEOUS.

- 651,826. Automatic System of Refrigeration. Clyde J. Coleman. Chicago, Ill., assignor to Thomas J. Ryan, New York City. Filed June 24, 1899.
   651,827. Electrolytic System of Refrigeration. Clyde J. Coleman, Chicago, Ill., assignor to Thomas J. Ryan, New York City. Filed Oct. 20, 1899.
   651,843. Phonograph. Emile C. Geneux, Jeanerette, La. Filed June 9, 1899.
   651,843. Filed Flextrolytic Apparatus. May Heag Aue Germany.

- 531,843. Phonograph. Emine C. Geneux, Jeanerette, La. Filed June 9, 1899.
  551,849. Electrolytic Apparatus. Max Haas, Aue, Germany. Filed May 26, 1899.
  651,850. Programme-Clock. William H. Hall, Chicago, Ill., assignor to Alvarado T. Benson, Harry J. Cassa Iay and Mattle A. Hall, same place. Filed Sept. 6, 1898.
  651,853. Machine for Making Electrodes for Storage Batteries. William W. Hanscom and Arthur Hough, San Francisco, Cal., assignors to James O'B. Gunn, same place. Filed April 6, 1899.
  651,908. Magnetic Chuck. Oakley S. Walker, Worcester, Mass. Filed Feb. 23, 1899.
  651,916. Furnace for Producing Calcium Carbid. John Zimmerman and Isedore S. Prenner, Chicago, Ill. Filed June 8, 1899.
- 8, 1899.
  936. Indicating-Key for Selective Signals. Charles R. Scribner, Chicago, and Frank R. McBerty, Evanston, Ill., assignors to the Western Electric Company, Chicago, Ill. Filed July 25, 1998.
  978. Electric Belt. William C. Fedwick, Des Moines. Ia., assignor to M. V. Sedwick, Grinnell, Ia. Filed April 5, 1899.

- 1a., assignor to M. V. Sedwick, Grinnell, Ia. Filed April 5, 1899.
  652,124. Controlling Electric Motors and Apparatus Therefor. Henry Leitner. London. Eng. Filed July 10, 1899.
  652,152. Phonographic Clock. Erwin Treitschke, Dresden-Blassewitz, Germany. Filed July 15, 1899.
  652,187. System of Electrical Distribution. Sigvald Krohn, Berlin, Germany. Filed Nov. 2, 1899.
  652,214. Apparatus for Measuring Consumption of Electric Currents. Cesar R. Loubery. Paris, France, assignor to himself, Emmanuel Francois and Henry Kunkelmann, same place. Filed Feb. 17, 1899.
  652,217. Electric Belt. Michael A. McLaughlin, Los Angeles, Cal. Filed Dec. 27, 1898.
  652,223. Electrical Warp Stop Motion for Looms. Henry I. Harriman, New York City. Filed June 14, 1899.
  652,223. Reception and Translation or Retransmission of Telegraphic Signals. Alexander Mulrhead, London, England. Filed March 15, 1900.
  652,230. Art of Reducing Attenuation of Electrical Waves and Apparatus Therefor. Michael I. Pupin, Yonkers, N. Y. Filed Dec. 14, 1899.
  652,231. Art of Reducing Attenuation of Electrical Waves. Michael I. Pupin, Yonkers, N. Y. Original application filed Dec. 14, 1899. Divided and this application filed Dec. 14, 1899. Divided and this application filed May 28, 1900.



### THE TELEPHONE WORLD.

Copenhagen, Denmark, Telephone Exchange.

One of the largest and finest telephone exchanges in North ern Europe is the one in Copenhagen, Denmark. The building was especially erected for the purpose, two large halls being reserved for the switchboard rooms. In 1896 the exchange was fitted up in the top hall, which is large enough to accommodate a board with a capacity of 10,000 subscribers. The number of subscribers was then 5,600, except the junction and long distance lines, and has since been largely extended. The room is splendidly decorated with busts and paintings, and the boards are placed in two straight lines; the ceiling, being glass framed, is arched across, thus giving a fine overhead light. The ventilation is especially cared for, the cold air being first forced through a fine sieve, which keeps out the dust, and is then kept at an even temperature by means of fans circulating it through the switchboard room, and finally it goes out at the other end of the room. In one end of the hall there is a balcony, from which visitors are allowed to watch the operation of the board, and they are thereby able to get an idea of the work done by the many times much abused operators. The board itself was designed by the company's own eminent engineer-in-chief, Mr. Jensen, and made by L. M. Ericsson & Co., of Stock-holm, Sweden. Each subscriber has his own drop, key and cord, so the answering is done simply by pressing down the key, and the wanted connection is given by the cord, which makes the service extremely rapid. The called subscriber's drop is automatically cut out during the conversation by a At the annual meeting of the stockholders of the Cleveland Telephone Company, recently held in Cleveland, it was decided to increase the capital stock \$1,000,000 in order to provide for contemplated improvements to the system. The capital stock of the company has been \$3,000,000, and it wa increased to \$4,000,000. The company contemplates nine additional branch exchanges, some of which are already in process of construction. The following board of directors was elected by the stockholders: Charles E. Adams, Charles J. Glidden, Lowell; John E. Hudson, Thomas Sherwin Boston; Frank F. Hickox, Alfred B. Hough, Lee McBride, William J. McKinnie, James P. McKinstry, Edward P. Williams, Edward P. Wright, all of Cleveland. The board of directors organized by the election of the following: President, Charles J. Glidden, Lowell, Mass; vice-president, J. P. McKinstry, Cleveland; treasurer, Charles A. Grant, Lowell, Mass.; secretary, George B. Perham, Lowell, Mass.

The Michigan Telephone Company (Erie system) successfully laid on June 2!, a cable 3½ miles long connecting the Island of Mackinac with St. Ignace. The cable has 8 copper metallic circuits equivalent in conductivity to No. 12 copper wire and 2 copper metallic circuits equivalent in conductivity to No. 8 copper wire of the same size as used on the Boston-Omaha Long Distance circuits. The following officials of the Michigan Telephone Company were present at the laying of the cable: Chas. J. Glidden, Chas. E. Adams, H. J. Pettingill, Jas. H. Mills, J. W. C. Pickering, John B. Stauffer, F. A. Cutting, George B. Perham, Chas S. Tuckerman. Telephone

The N. Y. "Commercial" publishes a dispatch from Minneapolis, Minn., which states that a deal is on by the terms of which the property of the Mississippi Valley Telephone Exchange, which has made a most plucky fight for three years against its great competitor, the Northwestern Telephone Exchange, a lessee of the Bell Company, is to be controlled by a company of local capitalists. The new company includes five or six bankers, business men of Minneapolis, and three St. Paul capitalists. They made a proposition to J. C. Hubinger, owner and general manager of the "Mississippi," who spent over \$600,000 in establishing telephone exchanges in Minneapolis and St. Paul. It is the intention of the new company to put in as much more money before the end of the year, to vastly increase the efficiency and scope of the present exchange. It now has in operation in Minneapolis about 2,800 telephones and over 4,500 subscribers; in St. Paul about 1,000 'phones and over 3,000 subscribers; in St. Paul about 1,000 'phones and over 3,000 subscribers;

The Pittsburg & Allegheny Telephone Company has purchased a site for the new Allegheny exchange at Parkway and East Diamond street, Allegheny, Pa, for \$25,000. A new brick exchange building costing \$25,000 will be started at once and completed within ninety days in order that the Allegheny subscribers for the independent instruments may early have the use of 'phones. The company has every pole in place in Allegheny and over 60 per cent. of the subways completed, although the ordinance granting privileges for the new system was only passed last March. The company now has 5,700 subscribers and is getting new ones at the rate of 125 every week.

The Northwestern Telephone Exchange Company has extended the minute service from Barnesville, Minn., and all stations on its lines to the Twin Cities.

The Citizens' Telephone Company of Grand Rapids, Mich., has bought the Peninsular system, comprising several exchanges and more than 100 miles of long distance wires in Southern Michigan.

The Interstate Telegraph and Telephone Company, chartered in New Jersey and Pennsylvania, is building a telephone line between Norristown and Trenton.

#### TELEPHONE INCORPORATIONS.

The City Telephone Company, Tabor, Iowa-to operate a telephone exchange. Capital stock, \$12,000. Incorporators: S. Lindsay, M. T. Davis F. Anthony, J. C. Rhode, L. McDaniel, A. A. Feiling, all of Tabor.

The Chamberlain Independent Telephone Company, Webster City, Iowa—to operate a telephone exchange. Capital stock. \$20,000. Incorporators: A. W. Chamberlain, J. W. Lee, E. L. Chamberlain, A. G. Bremer, all of Webster City.

The Kraft Combination Telephone Company, Chicago, Ill, Capital stock, \$375,000. Incorporators: Charles H. Kraft, William L. Rohrer, and I. M. Hamilton.

The Hamler Telephone Company, Hamler, O.—to construct and operate a telephone system. Capital stock, \$10,000. Incorporators: F. D. Quintis, W. S. Barhite, A. M. Jackson, J. I. Montgomery and O. Higgins.

The Louisa Telephone Company, Louisa, Va. Capital stock, \$25,000. Incorporators: J. J. Porter and F. W. Sims, both of Louisa.

The Independent Telephone Supply Company, Chicago, Ill.—to manufacture telephone supplies. Capital stock, \$2,500. Incorporators: F. B. Macomber, G. S. Whyte, A. F. Coles, all of Chicago.

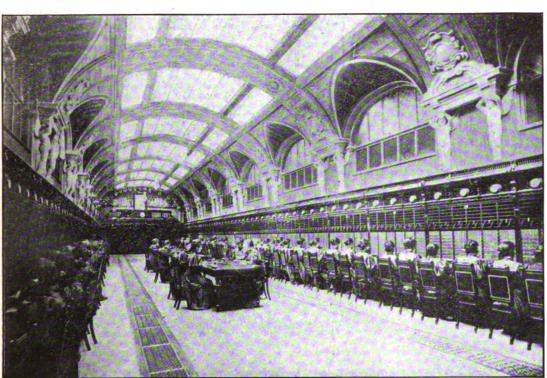
The Pioneer Telephone Company, Pioneer, O.—to construct and operate a telephone system. Capital stock, \$3,000. Incorporators: L. A. Beard, C. A. Kerr, W. F. Kessler, H. G. Young, F. J. Hadley, M. T. Hodson, A. E. Quidort and J. P. Hannan.

The New Union Telephone Company—to operate between Glens Falls, South Glens Falls, Sandy Hill, Fort Edward and the adjacent towns and to Albany and Troy, N. Y. 'Capital stock, \$100,000. Incorporators: B. B. Fowler, L. M. Brown and Arnold Wurtenberg, Glens Falls.

The Lewisburg Telephone Company, Lewisburg, O.—to construct and operate telephone lines. Capital stock, \$1,500. Incorporators: W. G. Brown, E. C. Priddy, D. E. Horn, T. L. Gregg and P. L. Coleman.

The Summit Telephone Construction Company, Akron, O. Capital stock, \$5,000. Incorporators: W. A. Green, F. S. Foltz, B. W. Green, G. A. Shaffer and T. W. Wakeman.

The Cortlandt Home Telephone Company, Cortlandt, N. Y.—to operate in Cortlandt and Homer. Capital stock-\$7,300. Incorporators: Charles D. Ver Nooy, Willard H. Jones, George J. Hager, William Martin and Herbert L. Smith.



MULTIPLE SWITCHBOARD IN THE COPENHAGEN EXCHANGE—CAPACITY 10,000 SUBSCRIBERS.

relay. The multiple jacks are made very small, eight inches in length, in order not to have the operator reach too far. When the top hall is filled up, another exchange of the same size and capacity will be installed on the next floor. The cross connection board is made large enough to take 12,000 subscribers, and the cables from the outside are partly brought from the permanent derrick (or tower) and partly from the underground cables, all passing through carbon lightning arresters, and as at present Copenhagen has no trolley lines, it is, consequently, not yet necessary to have any fusible coil arrangement. Additions made in Copenhagen within the past years are 8,000, of which is a new switchboard of 7,400 capacity for public call-stations exclusively. In the mainland of Denmark all the telephone companies have amalgamated into one large concern, which, within a few years, in the large centers, has put in complete exchanges with the L. M. Ericsson & Co.'s "standard" type multiple board.

The Highland Telephone Company has bought an interest in the telephone exchange at Monroe, N. Y., and will extend the same to Chester, Washingtonville, Highland Mills, Cornwall and all intermediate points.

The Colorado Telephone Company, Pueblo, Col., has increased its capitalization from \$1,500,000 to \$8,000,000.

communication was had with Boston, New York, St. Louis, Cleveland, Milwaukee, Chicago, Detroit and other long distance points.

The New York Telephone, Telegraph & Cable Company, which recently acquired control of the independent telephone lines in Westchester County, has given a contract to A. S. Deveaugh, of New York to rebuild and repair the entire system at a cost of about \$30,000. The company will also build exchanges in Yonkers, White Plains and a number of other places where it has franchises, and expects to have 125 miles of wire in operation in the county by December 1.

Advices from Rochester, N. Y., state that the striking Bell Telephone Company linemen have succeeded in making a great deal of trouble for the company. The wires inside the city line have been carefully watched, but this has not prevented the strikers from cutting many of the long distance wires and otherwise hurting the long distance service.

The Missouri-Kansas Telephone Company is rushing the work on the line between Wichita and Kansas City.

Tha Cumberland Telegraph & Telephone Company has extended their line from Ortella to Archer, Tenn.

#### GENERAL NEWS.

#### What is Going On in the Electrical World.

#### LIGHTING.

Algonac, Mich. This town will expend \$20,000 in

Arlington, N. J.—A new electric light and power company has been formed in Kearny with W. Hanna of East Newark as president. The capital stock is \$150,000. A large plant will be erected on the Kearny shore of the Passaic River, and it is the company's purpose to furnish electric light in Hudson and Essex Counties.

Ashland, Ore.—Improvements to the amount of \$4,000 are to be added to the electric light plant at this

Blair, Neb - This town is agitating the question of owning its electric light plant

Binghamton, N Y.—John J. Irving is considering a scheme to construct an electric plant to light the court house, county clerk's (flice, jail, and possibly the armory and county house.

Bonham, Tex.—A short time ago the two electric light plants of this city were consolidated and now the question of erecting a municipal electric light plant is under consideration.

Brooklyn, N. Y.—The electric light plant at Ridge-wood Park was recently destroyed by fire.

Clyde, Ill. - A recent fire and explosion wrecked the plant of the Electric House Lighting Company. Loss, \$17,000.

Conemaugh, Pa.—Bids will soon be advertised for the erection of a new electric lighting plant at this place, for which \$12.500 in bonds have been voted.

Dothen, Ala.—It is an assured fact that an up to-date electric light plant is to be installed here soon. The proposed plant is to cost between \$10,000 and \$12,000.

Ducktown. Tenn. - The electric light question is being discussed here.

Elbs, Wash.—An electric plant to cost between \$150,-000 and \$200,000 will be erected at the Naqually Falls near this place, providing Tacema will make a contract for lighting.

Florence, Ala.-E. A. Schubert has been granted a franchise to erect an electric light plant.

Greensboro, N. C. — The aldermen have granted a franchise to the Guilford Power Company for an electric lighting plant. The franchise must be accepted within 6) days, and the work of constructing the plant begun within 6) days thereafter, or it becomes void.

Lawrenceburg, Ind.—This city will receive propositions until August 1 for the construction of an electric light plant for lighting the streets of Lawrenceburg and the adjoining town of Greendale. Address Jos. F.

Marshalltown, Ia. — The board of supervisors has decided to install a complete electric system to light all county buildings.

Milwaukes, Wis —Plans are being considered for the es a bishment of an electric lighting plant in the Chamber of Commerce and Mitchell tuildings.

Newberry, Mich. — This village will issue bonds for an electric light plant and waterworks.

New Iberia, La.—T. W. Nicol of Mobile, Ala., has been engaged as consulting engineer for the proposed electric light plant here.

North Amberst, O. — The citizens are contemplating the construction of an electric light plant.

Ontario, Ore —The city council has granted the petition of Messrs. J. J. Cortright and L. Adams for a franchise to erect an electric light, power and heating plant.

Osgood, Ind. - James B. Nelson of Indianapolis has been preparing the plaus and specifications for an elec-tric light plant for this place.

Pittsburg, Pa.—The Eichbaum building, which was o cupied by the Holmes Electric Protective Company of this city, was recently destroyed by fire, entailing a

Port G been, Miss. — The election for the issuing of \$12,000 worth of bonds to improve the waterworks and electric light plant was held recently and was carried in favor of the issuance.

Richmond, Ky.—Pursuant to the decree of Circuit Judge Scott, advertusements have appeared announcing the sale on July 12 of the Richmond electric light plant, just erected in this city.

Ruston, La—This city is about to issue \$25,000 in bonds for the construction of an electric light plant.

Siginaw, Mich —The citizens are agitating the ques-in of erecting an electric light plant to be owned by the city.

South Haven, Mich. — At a recent election held here it was voted to bond the town for \$10,000 to complete t ie electric light plant.

St. Louis, Mo — A reso'ution was recently adopted instructing the board of public improvements to furnish an estimate of the cost of putting in an electric light plant in the new city hall for turnishing light to the city institution. the city institutions.

Swampscott, Mass. — This town is making arrangements to secure its own electric lighting plant

Toronto, Can.—Tenders will be received until July 3 for a complete electric light plant for the village of E at Toronto. Address H. F. Strickland, engineer, East Toronto.

Two Harbors, Minn.—At a recent election it was voted to issue bonds for the purpose of enlarging the electric light plant. About \$20,000 will be expended on the improvements.

Wabash, Ind.—The First National Bank of New York City has purchased the Wabash electric light plant here and will operate it incorjunction with the Wabash waterworks which the bank owns. The capacity it is stated, will be doubled.

Walla Walla. Wash —This town is agitating the question of building an electric light plant.

Warrenton, Ga. — This town desires estimates on an electric light plant of 12 arc and 300 to 500 incandescent lights. Address B L. Battle.

Waynesboro, Va — The Waynesboro Electric Light Company will enlarge its plant.

Waynesville, O -The question of erecting an electric light plant here is being considered by the citizens

Webb City, Mo. — An ordinance has been adopted providing for the issuance of \$20,000 in bonds for erecting an electric light plant.

#### STREET RAILWAYS

Bristol, Pa.—Hugh B Eastburn, of Doylestown, was recently here in the interest of the New Jersey Trolley Company which desires to extend its line through this place to Emilie and Fallsington to Trenton.

Bronxville, N. Y.—The New York, Westches'er & Connecticut Traction Company, owned ly the P. H. Flynu syndicate of Brooklyn, has secured a franchise in this village that gives it the right to complete and operate a line over the White P ains road, connecting the proposed Tuckahoe line with the North Mt. Vernon electric road, which is now owned and operated by the syndicate

Columbus, O—The Urbana, Mechanicsburg & Columbus Electric Railway Company was lately granted a franchise in Franklin County by the commissioners. The company is to beg n work on the road October 1.

Edwardsburg, Mich.—A report is current here that there is strong probability of an electric railway being built from South Bend, Ind., to D. amond Lake, via this place and Esgle Lake.

Elwardsville, Ill.-The St Louis & Illinois Electric Railroad Company has been incorporated to build an electric street railway from East St. Louis to this place. F. Vorwald, C. N. Travous and W. M. Watnock are all interested.

Find ay, O.—A contract was recently entered into by Theodore Wentz, president of the Findlay, Fostoria & Toledo E ectric Bailroad, for the construction of the road between this point and Fostoria by October 1.

rosu between this point and rostoris by October I.

Ionis, Mich.—The common council will at its next
meeting be asked for a franchise for an electric railway
through this city. F. H. Taylor of Detroit, says work
will soon be commenced on an electric road along the
river road out to Saranac. Lowell, Ada and Grand
Rapids. It will cost \$500,000.

La Porte, Ind.-The La Porte & Michigan City Railway Company was recently incorporated with \$300,000 capital stock with headquarters in the city. J. A. Brett, of Chicago, is presuent of the company, which will operate an electric railway between here and Michigan City, a distance of about 14 miles.

Leechburg, Pa.—The village council has granted the right of way through this town to the Apoilo Vandergrift & Leechburg Electric Bailway Company, and the work of constituting the line will soon begin.

Marysville, ()—The Union Coun'y commissioners have granted a franchise to Judge John 8 Gill of Columbus for the turpose of building the Columbus, Dublin, Plain City, Mechanicsburg and Urbana electric line through here.

Napoleon, O—Cleveland capitalis's headed by ex-Mayor McKisson have been in this county promoting an electric railroad from Fremont to D flance touching

Bowling Green and this p ace on the way.

New York City.—It is stated that the American
Railway Company, of No. 6 Wall street, proposes to
build an electric road and make trips from this city to
Chicago by means of cigar-shaped cars in five hours.

The cars are to lun on a single rail.

Niagara Falls, N Y.—The Niagara Falls Street Railroad Company proposes to build a crosstown electric line. Construction will begin as soon as permission is granted by the railroad committee.

Pompei, Mich. - The electric road is a certainty for

Portsmouth, O-Parties from Huntington, Virgina., have recently been negotiating for terminal facilities at this place for an electric freight and passenger road from Ironton, running through Hanging Book, Franklin Furnace, Wheelersburg and Scioto-

Redding. Cal.—The McCloud River E'ectrical Power Company was lately granted a franchise by Shasta County supervisors. The company will operate an electric railroad between here and Copper City a distance of 30 miles. The route is via Keswick, Copley and Kennett to the Delamar copper mines.

San Bernardino, Cal.—J. L. Campbell is interested in a proposed electric railway for the place.

Sauquoit, N. Y.—Talk of building an electric road from Utics to this place via Willowvale is being revived. It is now stated that New York capitalists are interested and that the road will go through.

Slatington, Pa.—The Slatedale S:reet Railway Company has been chartered to operate a trolley street railway between here and Slatedale, Lehigh County. The length of the road is about four miles. Those interested are Francis J. Crilly, John L. Schwartz, Patrick F. Cannon, Francis A. Kreitz and Walter J. Sager, all of Allentown, Pa.

Ware, Mass.—The selectmen recently voted to grant a location to the Worcester & Hampshire Street Railroad Company for a trolley line which will go to Gilbertsville and West Brookfield, and connect there with the line to North Brookfield.

Weyauwegs, Wis.—The Hutchirson Electric Rail-way Company is a new corporation here, and contem-plates the construction of an electric line from New London to Berlin touching Royalton and this city.

Wheeling, W. Va.—The Ohio Valley E'ectric Com-pany has been organized to build a trolley road from this city to Wellsburg.

Woodmont, Conn — Express trolley cars for the benefit of the people of this place will be put in service July 1, and will make the run to Bridgeport in fity minutes.

#### MANUFACTURING.

B. ston, Mass. — The Choralcelo Manufacturing Company of this city was recently organized to manufacture and deal in electrical musical instruments on a capital of \$3,000,000. Among these interested in the concern are E M Crosby, W. L Flint, G. S. Heath, G. B. Sinclair, A. B Upham, all of Wakefield, Mass.

Jersey City, N. J.—A new concern, capitalised at \$3 000,000 and known as the Varley Duplex Magnet Company, will manufacture and deal in magnets, duplex electric motors, etc. Its principal effice is to be in

Trenton. N J.—The Pyro-Electric Company, with a capital of \$500,000, has lately been formed to manufacture electric machinery. The incorporators are W. E. Gilmore of O anne; E. L. Brown, G. G. Kolff, both of New York; H. Buil, attorney, of New York City.

#### COMPANY MATTERS.

Albany, N. Y.—At a recent meeting of the stock-holders of the United Traction Company held in this city the following directors were elected: Robert C. Pluyn, Francis N. Mann, Jr., Anthony N. Brady, William Kemp, A. Beecker Banks, Charles Cleminshaw, John G Myers, Edward Murphy, Jr., Simon W. Roseadale, William Shaw, John W. McNamara, James O'Neil, James H. Manning, William J. Walker and George P. Ida.

Manning, S. C.—F. P. Ervin has been elected manager of the Cotton Seed Oil Mill and Electric Illuminating Company, recently formed here with a capital of

\$3),000.

New York City. — The Western Electric Company of 463 West street will spend \$20,000 in alterations to the building at No. 149 Bank street. The company will use the building as part of its plant.

Portsmouth, N. H.—The annual meeting of the stockholders of the Portsmouth, Kittery & York Electric Street Railway Company was held this month. The following were elected directors: E. Burton Hart, Jr., and Theodore L. Peters of New York; F.E. Bowell, Horsce Mit hell and W. G. Meloon of Kittery; N. M. Walker of York, and M. I. Masson of Brunswick.

St. Elmo. Tann. — The Chattanoges Medicine Com-

St. Elmo, Tenn. — The Chattanooga Medicine Company has decided to dispense with steam power and operate its plant located here, by electricity.

#### POWER AND TRANSMISSION PLANTS.

Port Arthur, Can —An electric power plant to generate 6 10,000 horse power is to be erected to utilize the falls of the Kaministiqua River near this place and Port Williams. It is proposed to invest \$5,000,000 in the works.

York Haven, Pa .- Work will be commenced next month on the construction of a power plant on the Susquehanna River at this place. Engineers have estimated the cost of the work at from \$2,500,000 to \$5,000,000. The plant will be developed by the York Haven Power & Water Company.

#### AUTOMOBILES.

Newport, R. I. — The New England Electric Vehicle and Transportation Company arrived here a few months ago, and has been constantly enlarging its plants, having invested nearly \$200,000 in its business until now there are in the station nearly 100 automobile vehicles of different patterns, and many more will be added before the season closes.

St. Louis, Mo — Last week President Mahon left for Chicago. Detroit and Cleveland for the purpose of shipping to this city 450 regulation 'buses which the union his secured and to negotiate with the manufacturer in Cleveland, O, for the purchase of automobiles for use in the boycott against the Transit Company.



#### LECTRICA SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electricity from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., conscidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gon., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

### STOCKS.

PASSE	N	GER R	AILW	AYS.			PASSENGER RAILWAYS.						
Capital Stock.							Capital Stock.						
NAME.	Par	Authorz'd	Issued.	Bate and Date of Last Div.	Bid.	Asked,	NAME.	Par	Authorz'd	Issued.	Rate and Date of Last Div.	Bid.	Aske
Albany, N Y. June 25 United Traction	100	\$5,000,000	\$5 000 000	1½ % Q.,	124	125	Hartford Conn.—June 25 Hartford Street Ry. Co Hartford & West Hartford RR	100	\$4,000,000 1,000,000		3 % S., Oct.,	150	2
Troy City Railway.)							Holyoke MassJune 25 Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	2073	212
Allentown Pa June 25						1.5	Hoboken, N. JJune 25.						
Allentown & Lebigh Val. Trac. Oo.		4,000,000	1,500,000		**	15	North Hudson Co. (N. J.) By. Co	25	1,250,000	1,000,000	8 %,	150	
Bridgeport, Conn-June 25: Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	105		Indianapolis, Ind-June 25.		5,000,000	5,000,000	***********	24	24
Baltimore Md. – June 25 a United Rail ways & Elec. Cocom.	50	24,000,000	18,000,000		23	281/9	Lancaster, PaJune 25 Pennsylvania Traction Co Lancaster & Col. Electric By		10,000,000	9,900,000 87,500		-	=
BOSLON./Mass.—June 25 Naw England Street Ry North Shore Traction Co	100 100 50	4,000,000 2,000,000 10,000,000	4,000,000 2,000,000 9,085,000 6,400,000	1 % Q., Jan.15, 6 % S., A. & O. 3% % S., Oct., '19. 4 % S., Jan. 2% % Aug. 99,	15 85 98 112 139	16 87 631/2 114 140	West End Street Railway  Louisville, Ky.—June 25: Louisville Rycom Louisville Rypfc  Minneapolis, Minn.—June 25	100	4,000,000	8,500,000 2,500,000	1½ %., April, 2½ % S., Oct. 1,	78 110	79
Brooklyn N. Y June 25; Brooklyn City Ry Brooklyn Rap. Transii Co., ir cerif Brooklyn Heights Railroad	100	2,000,000 43,000,000 200,000	48,000,000		229 521/ 107 207	280 521/4 109 289	Twin City Rapid Transitcom Twin City Rapid Transit			1,712,200	13/4 %, Oct, 8 % S., M. & N. 13/4 % S., J. & J.	186	68 187
*dBrooklyn City RE guar  *Brooklyn Queens Co. & Sub. RE. Coney Island & Brooklyn RB.  Kings County Elevated  Kings County Traction Co  Nassau Electric Rallroadpfd.	10	2,000,000	1 884 200	2 % Nov., 99	320	825	Memphis TennJune 25: Memphis Street Railway Co					100%	100
gBrooklyn, B. & W. E. Railroad	D	6,000,000 2,000,000 1,000,000	2,000,000		75	86	New Haven, Conn.—June 25: Fair Haven & Westville RR New Haven Street Railway 00 New Haven & Centerville	. 100	1,250,000	2,000,000 1,000,000	8 % S., Sept. 2½ % A., July	89	41
Buffalo N. Y June 25: Buffalo & Niagara Falls Elec. Ry	10 10			1 % Q. Dec., 99	74 99	75 100	Winchester Avenue RR New Orleans, LaJune 25	. 20		600,000		15	46
*Buffalo Railway Co	10	0 8,000,000 0 1,500,000	8,000,000 1,500,000	1 % Q., Feb.	25 88	28 88	Canal & Claiborne RR, Co New Orleans & Carrollton RR. New Orleans Traction Co new com New Orleans Traction Co new pfd aCrescent City RRguar bNew Or. City & Lake RBguar	100 100 100 100	1,200,000 0 2,000,000 0 2,000,000	***********	4 % S., July, 1½ % Q., Oct. 8 % S., Jan., 4 % S., Jan., 1½ %., June, 1½ %. Oct.,	148 % 22 % 95 20 %	24 96 26
Oharleston City Ry. Co	25	1,000,000	250,000	8 % 8.	::	::	Orleans Railroad St. Charles Street Railway New Yopk—June 25:	50	1,000,000			561/	
Chicago City Ry. Co. Conicago & South Side R. T. RR. Lake Street Elevated RR. Metropolitan West Side Elev. Ry. Met West Side El., pfd. North Chicago Street RR. ANorth Chicago City RR. South Chicago City Rallway. West Chicago St. RR. Co. Union Traction Ry. Union Traction Co. pref	10 10 10 10 10 10 10 10	0 10,823,800 0 10,000,000 0 15,000,000 1 15,000,000 0 10,000,000 0 2,000,000 0 20,000,000 1,250,000	10,828,800 10,000,000 7,600,000 9,000,000 249,900 1,608,200 18,189,000	Feb 28 1900.	252 10 27 77 209 	258 10 <sup>1</sup> / <sub>2</sub> 31 75 210  18 61 <sup>1</sup> / <sub>2</sub>	Central Crosstown RE cChristopher & 10th Sts. RRguar Dry Dock, E. Brdw'y & Battery RE dMetropolitan Street Ry. Co «Bleecker St. & Fulton Fy. Ry. gua fBroadway & Seventh Ave gual oCen.Park,N.&E. Rivers RR. gua hEighth Avenue RR i42d St. & Grand St. Ferry RR. gua fNinth Avenue RR gua fNinth Avenue RR gua fTwenty-third St. R. R. Co gua	100 100 100 100 100 100 100 100 100 100	0 650,000 1,200,000 45,000,000 0 2,100,000 1,800,000 1,000,000 0 750,000 800,000 2,000,000	748,000 800,000 2,000,000	4% % Q.	270 178 100 147 85 230 199 875 895 198 -03 400	800 844 125 1.77 87 240 201 425 410 205 210 415
Cincinnati, OhioJune 25:							Second Avenue RR	. 10	0 2,500,000	1,862,000	4½ % Q. 2% Q., Jan,, \$1.75 p. sh. Feb.	198 108	201
Cincinnati Inc. Plane Bycom Cincinnati Inc. Plane Rypfd Cincinnati, Newport & Cov. St. Ry tCincinnati Street Ry. Co	10	1,000,000 150,000 0 3,000,000 0 18,000,000 0 2,500,000	575,000 150,000 8,500,000 14,000,000 2,200,000	%% Feb. 02%% Feb. 01%% Q., Jan. 01%% Q., Jan.	75 124 5 126 5		mi2d St., Manhatv'le & St. Nich. A. *Union (Huckleberry) Ry.  Newark N. JJune 25: Consolidated Traction Co. of N. J.	100	0 2,500,000	2,500,000	***************************************	190 190	200
Cleveland, Ohio.—June 25 Akron, Bed. & Olev. Elec, Ry Oleveland City Ry Oleveland Electric Ry	10	0 1,000,000	1,000,000 7,600,000	34 % Jan. 3-5 % Jan. 34 % Q., Oct., '99	48	50 101 871	North Jersey Traction Co	100	6,000,000 504,000	6,000,000 504,000	115% % A.	27 240 55	27 250 56
Detroit, Mich.—June 25 Detroit Citizens' Street Ry	10	2,000,000 0 2,000,000 1,000,000	1,250,000 1,200,000 250,000 1,000,000		1003 175 90		OUOnsolidated Traction Co	- 50 - 50 - 50 - 50	0 15,000,000 0 9,478,850 0 1,500,000 0 8,000,000 0 8,000,000 0 2,500,000 5 1,400,000	15,000,000 9,000,000 1900,000 18,000,000 1,900,000 1,400,000	2 %, Jan. 2 %, Jan. 8 %, Nov, 1 % % Nov. 6 % A. 8 % A. 2 % %, Nov.	243/69 123/4	64 70 92
Dayton OJune 25 City Railway Co	10	1 500 000	1,470,600	1½ % Q. 1½ % Q.	140 170 114	145	Pgh., Allegheny & Man. Trac, Co Pittsourg & Birmingham Trac, Ry. Pittsburg & West End Ry United Traction Cocom United Traction Copref	- 50 - 28 - 50	11,000,000	1,500,000 8,000,000 17,000 000	8 % A. 8 % A. 8 % %, Nov. 2 % %, July, 2 %, Aug. 1 %, Oct. 5 % A., June J. & J. J. & J.	41 14 513	14

\*Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds. b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Rapid Transit Company; road operated by Brooklyn His. Co. f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR. g Owned by Atlantic Ave. RR and leased to Nassau system.

h \$30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co., 1250,100 of stock owned by North Chicago Street Railroad Company.

c Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j 85 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company.

j 85 % per annum paid on outstanding capital as rental by lessee. North Chicago Street Railroad Company.

j 85 % per annum paid on outstanding capital as rental by lessee. North Chicago Street Railroad Company.

j 85 % per annum paid on outstanding capital as rental by lessee. North Chicago Street Railroad Company.

j 85 % per annum paid on outstanding capital as rental by lessee. North Chicago Street Railroad Company.

j 85 % per annum paid on outstanding capital as rental by lessee. North Chicago Street Railroad Company.

j 86 % per annum paid on outstanding capital as rental by lessee.

Cinetinati 8t. Railway purehased the Mt. A. & Eden Park road, assuming its bends.

\* Unlisted. † Full paid. | Outstanding. ‡ Ex-div.
a Leased to New Orleans Traction Company at 6 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct,
c Leased to Z3d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Rgilway
g Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.
i Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.
i Leased to Metropolitan Street Rulway for 18 % on stock
i Leased to Metropolitan Street Railway for 18 % on stock.

Controlled by Third Avenue Railway for 18 % on capital stock.
m Controlled by Third Avenue Railroad by purchase.
n Dividends of 1% % yearly guaranteed by Consolidated Traction Company.
o Controls by lease the Alleg'ny, Cent., Oitizens' Duquesne, Fort Pitt & Pitt'n Traction.
p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
r Leased to Consolidated Traction Company for 8 % on capital stock.
s Leased to Consolidated Traction Company for 6 % on capital stock.
s Leased to Consolidated Traction Company for 6 % on capital stock.
s Leased to Consolidated Traction Company for 6 % on capital stock.

#### PASSENGER RAILWAYS. TELEPHONE AND TELEGRAPH COS. Capital Stock. Capital Stock. Bate and Date of Last Div. Bate and Date Last Div. NAME Aathors'd| Issued. E3d. Asked. NAME. Authora'di Issued. New Bedford Mass-June 25 Boston, Mass.- June 25 50,000,000 28,550,000 434 % Q., Jan. ..... 1 % Q., Feb. 20, 10,894,600 10.804,600 \$1,50 p. sh, Feb Railway Co... American Bell Telephone Co..... Erie Telegraph & Telephone Co.... New England Telephone Co..... 100 \$850,000 \$850,000 2 %, Feb. 160 165 298 800 1051/4 107 Northampton, Mass-June 2 181 IŁO 170 178 Northampton Street Rv...... 100 800,000 225.000 4 % A., June. New York.-June 25 Omaha, Neb.- June 25 94 106 170 5: 1:8 128 114 214 174 95 85 5.000.000 5.000.000 8 % A. and N. 65 ha Street Ry..... 100 Paterson, N. J.- June 25 Paterson Rv. Co..... 100 1,250,000 1,350,000 Providence, R. I.-June \$5: 109 111 100 8,000.00 8,000,000 3/ %, Oct. '98 United Traction & Electric Co .... 169 70 Philadelphia.-June 25 1,770,000 | 2 %, Dec. '\$9. | 1,966,100 | 2% %, July 15, '\$9. | 1583,900 | 2% 8—July, '99. | 300,000 | 3 % Feb. 1, '\$9. | 29,930,450 | 8,297,920 | 11,875,000 | \$14 sha'e A—Apr.\$9 :00 76 8 79 500,000 Miscellaneous, - June 25: 451 87 8,561,000 2 % 8. 66 210 150 80 1201 125 903 ••••• 750,000 2,000,000 2,500,000 157 ELECTRIO LIGHT AND ELECTRICAL MFG. 008. 2081 Boston, Mass.-June 25: Fort Wayne Electric trust receipts. Fr. Wayne Electric trust receipts. Ft. Wayne Electric Co. [old] General Electric Co. [new]..... T.-H. Elec. Co. T. Secur., Series D. Westinghouse Elec. & Mfg. Co. com. Westinghouse El. & Mfg. Co. opfd. Westinghouse El. & Mfg. Co. assent. 809 25 100 40,000,000 80,480,000 2 % Q., Aug., 1898 100 18,276,000 18,276,000 1% % Q., Jan., 1900 127% 71% 45 621% 44% 240 4.000.000 8,996,058 15/4 % Q., Jan., 8,195,126 Ruchester, N. Y .- June 25 11,000,000 Richester Railway Co..... New York.-June 25 100 5,000,000 5.000,000 RGW Y OPK.—June 20 Edison Elec, Ill'g Oo., New York... \*Edison Elec Ill'g Oo., Brooklyn.. Edison Ore Milling Oo. Edison Commission of Commi 100 100 100 7,988,000 2,000,000 1% % Oct., '98. 119 120 Reading, Fa.- June 25 9,188,000 4,000,000 1,000,000 850,000 1,000,000 1,000,000 Semi-an.,Jan. & Jy 850,000 Jan., '98. ‡1,000,000 Jan., '98. 12 93 100 40,000,000 80,490,000 2 % Q., Aug., 1998. 100 18,274,000 18,276,000 1% % Q., Jan., 1900 100 1,000,000 1,000,000 2,500,000 A. & O. St. Louis Mo.- June 25 St. Louis Mo. - June 25 Fourth Street & Arsenal By Jefferson Avenue Ry. Co. Lindell Ry. National Rallway Co. Cass Avenue & Fair Grounds... Oitisens' RR. St. Louis RR. Missouri RR. Pe pple's RR. Co. United Electric Ry. United Electric Ry. Louis & Suburban Ry. Uniton Depot RR. 1271 150,000 400,000 2 % Dec., 1888. 2,400,000 1½ % Jan., '99. 2,479,000 1½ % Jan. '99. 1,500,000 1½ % Jan., '99. 2,000,000 1½ % Jan., '99. 800,000 50c., Dec., '89. 500,000 1,000,000 50c., Dec., '89. 2,500,000 1,000,000 50c., Jan., '99. 4,000,000 8 % Jan., '99. **800,000** 400,000 **2,500,000 2,500,000 2,500,000** Kings Co. El. L. & P. Co. ... 135 Pittsburg, Pa.-June 25 Allegheny County Light Co...... East End Electric Light Co..... 166 172 Philadelphia, Pa.—June 25 Edison Electric Light Co........ \*Electric Storage Battery Co...pfd. Northern Elec. Light & Power Co... Southern Elec. Light & Power Co... 2.000,000 144 % 55 21 71 10 201 1.000,000 69 68 18% 550,000 2,500,000 4,000,000 187.500 Miscellaneous.-June 25 San Francisco, Cal.-June, 600,000 50c. monthly. 48 21 14 185 10 100 1,000,000 100 1,000,000 100 18,750,000 100 1,000,000 119 California St. Cable RR.... ceary Street Park & Ocean RR.... Market Street Ry... Presidio & Ferries RR.... 875,000 (2.50 share, '96. 18,750,000 Q., 60c. per share. 550,000 Scranton Pa - June 25 100 120 202 :8.54 163 500,000 1,050,000 Sprinetield III.- June 25 Springfield Consolidated By ... 100 750,000 750,00 was reduced I Ex div. Springfield O.-June 25 Springfield Street Ry..... 1,000.000 100 11 1,000,000 Springfield, Mass.-June 25 ALLIED INDUSTRIES. pringfield Street By..... 100 1,200,000 1,166,700 4 % ▲. 207 212 Toronto Canada.-June 25: Boston Mass.-June 25; 100 2 100 260 Toronto Street Ry...... Montreal Street Bailway Co...... 6,000,000 6,000,000 1% % B. 4,000,000 4 % B. American Electric Heating Co....... 50 1 Street Ry. & Illu'g Properties...pfd 100 United Electric Securities Co...pfd. 100 4,000,000 1,248,700 \$2 p. sh. Jan. 26, '99 1,000,000 \$8.50 p.sh. Nov '99 100 Washington, D. C.- June 25: 1041/4 105 New York.-June 25: Consolidated Electric Storage Co... Safety Car Heating & Lighting Co... Worthington Pump Co.....com. Worthington Pump Co......pfd 8 150 5.500,000 5,500,000 2,000,000 7 100 LIO Worcester, Mass.-June 25 8,000,000 2,000,000 550,000 81 1645 Philadelphia Pa.-June25 \*Worcester Traction Co......com. Worcester Traction Co......6 % pfd. Worcester & Suburban Street Ry... 10 1,500,000 50 10,000,000 100 8,500,000 5 525,100 5 500,000 Wilkesbarre, Pa.-June 25 2 X Q Wilkesbarre & Wyoming Val. Trac.. 100 5,000,000 5,000,000 1%, Jan. \*Unlisted. † Paid in. ‡ Full paid. † Outstanding. † Ex-div. a Leased to Hestonville, Man & Fairmount Passenger Ry, for 5 % on stock per annum. b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company. c Practically all shares owned by Union Traction Company. d Lease to Frankford & Southwark Passenger Ry, assumed by Electric Traction Co. Leased to Electric Traction Company. / Controlled by Frankford & Southwark Passenger Railway. g Leased to People's Passenger Railway at \$5 per share. h Majority of stock owned by People's Traction Company. / Leased to Union Traction Company. / Leased to Union Traction Company. / Leased to Union Traction Company. / Leased to United Traction Company. / Leased to United Traction Company at a rental of \$10,000 per annum in 1865-7-8 p.a. \$20,000 in 1899-1900 and \$30,000 per annum thereafter, payable semi-annually, rental, declared as a dividend semi-annually. b Dividend of 10 % guaranteed by Reading Traction Company. Dividend of \$6 % guaranteed by Reading Traction Company. Leased and operated by the Sorantee Railway Co., formerly Scrantee Traction Co. Pittsburg, Pa.-June 25 Oarborundum Mfg. Oo...... Standard Underground Oable Oo... ë 90 92 Miscellaneous.-June 25 Miscellaneous.—June 25 \*Barney & Smith Oar Oo...com. \*Barney & Smith Oar Oo...pfd. Billings & Spencer Co... Consol. Oar Heating Oo... Johns-Pratt Co... \*Pratt & Whitney Co... \*Pratt & Whitney Co... stillwell-Bierce Co... Stillwell-Bierce Co... Shuits Beiting Co... St. Oharles Car Co... \*\*Tillwell-Bierce Co... St. Oharles Car Co... \*\*Tillwell-Bierce Co... 1 × 1,250,00 1,250,000 1% % Feb 62 109 4 50 50 65 90 1(5 40 100 70 80 2 % Sept 1,'99. 100 500.00

## BONDS.

PASSEN	JER R	MILWA	8.			-	PASSENGER RAILWAY.						
To reasonable	Amou			Interest				Amo			Interest	1	
NAME.	Authorized.	Issued.	Duo	periods.	Bid.	Asked.	TABLE.	Authorized.	Issued.	Duse	periods.	Bid.	Asles
Albany N. Y.  Date of Quotation-June 25, 1900  The Albany Ry. CoCons. mtg. 5s. 1The Albany Ry. CoGen. mtg. 5s. 1Waterylet Turnplke & RR. 1st mtg. 6s	8500,000 750,000 850,000	427,500 875,000 850,000	1980 1947 1919	M. & N.	*117½ *117 *125	119%	New Orleans La. Dete of Quotation—June 25, 1900. Canal & Claiborne RR cons mig. &s Crescent City RR	\$150,000 5,000,000 416,500 5,000,000	*\$150,000 50,000 8,000,000 899,000 2,599,500	1899 1948 1908	"M. & N. M. & N. J. & J. J. & D. J. & J.	1081/4 108 112	112
Watervieit Turnpike & RR. 3d mig. 6s. Troy City Railway Co	150,000	150,000	1919 1942	M. & N.		127	†N. Orl's City & Lake RR 1st mig. g. 5s. N. Orleans & Carrollton RR. 2d mig. g. 6s. Orleans Railroad Co Oons. mig. 6s. 1\$4. Charles St. RR. Co 1st. mig. 6s. †\$428.500 in escrow to retire New Or leans City RR. Co.'s 1st mig. bonds. 1\$90.000 outstanding.	850,000 800,000 800,000	850,000 800,000	1907 1912	F. & A. J. & J. J. & D.		
Baltimore Md.		_	-				New York. Date of Quotation—June 25 1900.	-	*				
United Electric Ry. Colst mtg. g. 4s	38,000,000 14,000,000	18,000,000			102 748/4	1021/4	Atlantic Ave. (Brooklyn)Imp. g. 5s.	1,500,000 759,000	1,500,000 759,000	1909	M. & S.	95 1071/6	110
**Baltimore City Pass. Ry 1st mtg. g. 5s. Baltimore Traction Co	2,000,000 1,500,000 1,250,000 1,750,000 750,000 800,000 96,000 601,000 8,000,000 1,000,000	2,000,000 1,500,000 1,250,000 1,750,000  117,000 580,000 8,000,000 1,000,000	1929 1901 1942 1900 1906 1912 1962 1922	M. & N. M. & N. M. & S. J. & D. J. & J. N. & M. J. & J. M. & N. J. & D.	11878 119 10414 121 101 10214 119 116 117	75 120  121 ½	Haining Av. (Brooklyn). Cons. mtg. 5s. Broadway & 7th Ave	1,125,000 1,000,000 6,000,000 2,000,000 1,000,000 250,000 8,500,000 4,500,000	1,125,000 1,000,000 6,000,000 2,000,000 448,000 250,000 8,500,000 2,750,000	1948 1904 1914 1924 1905 1941 1989 1988 1941 1941	J. & D. J. & D. J. & J. J. & J. J. & J. J. & J. J. & J. M. & N.	115 128 104 108 115 105 116 115 101 104 112 107	116 125 105 110 117 106 117 116
All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.  BOSTON, MASS.						-	Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s Central Crossiown RR	700,000 1,200,000 250,000 800,000		1900 1902 1922 1908		109% 9%% 107 125 101	1(0 109 108 120
Date of Quotation- June 25 1800.  *Lynn & Boston RRlst mag. g. bs. West End Street RyDeben. g. 5s. West End Street RyDeben. g. 4%s.  †51,674,000 in escrow to retire outstand- ng bonds of absorbed companies.  Charleston S. C.	8,000,000 2,000,000	8,702,000 8,000,000 2,000,000	1902	J. & D. M.& N. M. & S	114 104% 112	115 106 	8D. Dock, E. Bd'y & Bat'y R. gen.mig.g. 5- Dry Dock, E. Bd'y & Bat'y R. gen.mig.g. 5- Dry Dock, E. Bd'y & Bat'y RR. scrip 5 %. Eighth Av. RR. Co Oert. Indebt. 6 %. 42d St., Man. & St. N. Av 2d mig. Inc. 6s. Lex. Ave. & Pav. Ferry RR. Ist mig. g. 5s. Metropolitan St Ry Oog. m. cl. tr. g. 5s Second Avenue Ry. Gen. cons. mig. 5s. Second Avenue Ry. Gen. cons. mig. 5s.	,200,000 1,500,000 5,000,000 12,500,000 1,600,000 800,000	1,100,000 1,000,000 1,200:000 1,500,000 5,000,000 1,500,000 1,600 000 800,000	1914 1914 1910 1915 1998 1997 1909 1909	F. & A. F. & A. M. & S. J. & J. M. & S. F. & A. M. & N. J. & J.	102 108 116% 82 124 120 120 1°8%	105 117 125 121 109
Bate of Quotation-June 25, 1900.  †Enterprise Street RR	500,000	47,000	1906	J. & J.			South Ferry RR. Co 1st mtg. g. 6s.	850,000	1,500,000 850,000 5,000,000			116	117 112 128
†Oharleston City Ry		****		J. & J.	106	***	Third Avenue RR	150,000 2,000,000	150,000 2,000,000	1909 1906	J. & J. J. & J.	106 118	108
Chicago III.  Date of Quotation—June 25, 1900.							†\$1,085,000 in escrow to retire gen. mig.	500,000	500,000		J. & J.	110	114
Ohicago City Ry	400,000 1,000,000 7,500,000 1,500,000 4,040,000 7,574,000 15,000,000 8,171,000 500,000	500,000	1908 1929 1907 1982 1928 1942 1906 1911 1900	F. & A. J. & D. A. & O. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J. J. & J.	1013/4	102 102 109 96%	bonds.  134,850,000 in escrow to retire maturing obligations.  §8552,000 in escrow to retire 1st and 2d mig. bonds.  §In treasury, \$80,000.  11 Guar. by Union By. Co.  TOPONIO CANADA.  Date of Quotation—June 25, 1900.  Montreal St. Ry		800,000 2,200,000	1908 1931	M. & S. M & S.		=
North Chicago City Ryconsol. 456s. West Chicago St. RR	2,700,000 12,500,000 1,500,000	2,500,000 8,969,000 700,000 6,000,000 1,500,000	1928 1911 1986	J. & D.	108 101 1065/8	111 102 107	5835,000 per m. single track authorised.  8600,000 in escrow to retire 5s due in 1901.  Philadelphia.  Date of Quotation.—June25, 1800  Continental Pass. By	100,000 150,000 250,000 500,000	810,000 200,000 100,000 	1000	J. & J. J. & J. J. & J. J. & J. M. & S.	****	
iAssumed by W. Chi. RR. Co., lessee. iInt. guar. by W. Chicago St. BR. Co Cincinnati, O. Date of Quotation—June 25, 1900 Oin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s 'Mt. Adams & Eden P'k In 1st mtg. 6s.		2,500,000	1922	J. & J. A. & O.	114 % 108 %	115 104	People's Pass. RyStk. trs. cert. g. 4s. Phila. City Passenger Rylst mtg. 5s. Philadelphia Trac. Co Coll. tr. g. 4s. Thirteenth & 15th 5t. Rylst mtg. 7s. Union Passenger Ry	1,125,000 5,698,210 200,000 1,800,000 100,000 500,000 29,785,000	200,000 1,018,000 100,000 500,000 29,724,876	1910 1917 1903 1911 1945 1905	J & . F. & . A. & O. A. & O. A. & O.		
†Mi. Adams & Eden P'k In let mig. 6s. †Mi. Adams & Eden P'k Inc. Cons.mig. 5s. 60. Cov. & Cin. St. Ry let mig. 6s. [So. Cov. & Cin. St. Ry 2d mig. 6s. † Assumed by the Cincin. St. Ry. Co. [\$250,000 reserved to retire let mig. bds.	100,000 581,0%0 250,000 400,000	100,000 581,000 250,000	1905 1906 1912	A. & O. M. & S. M. & S. J. & J.	114 108 <sup>3</sup> / <sub>4</sub> 12i ½ 182 <sup>3</sup> / <sub>4</sub>	1221/ <sub>4</sub> 187	West Phila. Pass. By	750,000	245,000 750,000	1906 1926	A. & O. M. & N.	*****	
Cleveland O.  Bate of Quotation—June 25, 1900  aBrooklyn Street RR. Oo	8,000,000 2,000,000 8,500,000 1,500,000 1,000,000 600,000 200,000	2,500,000 2,000,000 1,249,000 1,500,000 1,000,000 200,000	1922 1909 1918 1918 1910 1922 1915	J. & J. M. & S. M. & N.	1061/4 1181/4 1051/4 106	107 114 % 106 107 	Date of Quotation—June 25, 1900  Birmingham, Knox & Allentown	1,250,000 1,500,000 50,000 1,250,000 750,000	500,060 875,000 1,250,000 50,000 1,250,000 1,250,000 750,000 250,000 750,000 1,500,000	1942 1928 1924 1927 1929	M. & S. J. & J. A. & O. J. & J. J. & J. M. & N. J. & J. A. & O. J. & J.	1111/4	118
absorbed companies, marked a. Interest guar. by Cons. St. Ry. Co. Detroit, Mich. Date of Quotation—June 25 1600.							Frinsburg & West End	1,500,000 2,500.000 500,000	500,000 1,400,000 2,035,003 500,000	1989	A. & O.	****	* 10
†Detroit Citizens' St. Ryist mtg. 5s. Ft. Wayne & Belle Isle Ryist mtg. 5s. The Detroit Ry 1st mtg. 5s. †\$1,150,000 in ecrow to retire bonds of Det. City Ry. and Grand River St. Ry.	1.800,000	8,885,000 877,000 1,800,000	1902	A. & O.	105	1021/4	Date of Quotation - June 25, 1900	50,000 9,000,000	50,000 8,360,000	1910 1988	J. & D. M & S,	116	118
New Haven Copn.  Data of Quotation— June 25 1:00  Mew Haven St. Ry	250,000 100,000	600,000 250,000 500,000 24,000	1914 1912	J&D M&N	111 111 109	-Veli	Date of Quotation—June 25, 1900 Baden & St. Louis RR	250.000 1,818,000 2,000,000 1 660 600	250,000 1,818,000 1,500,000 000 000	1912 1907	J&J	101% 101% 100 17	102 102 109 118

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PASSE	VQER (	RAILW	AY	•		
	Ame	mut.		Intonet		
TAMP.	Authorized	Issued.	Due	Interest periods.	Bld.	Anked.
St. Louis.	Ī	Ì	Π		İ	Ī
Date of Quetation-June 25, 1900	400 000	400 000	,,,,,		1	,,,,
Jefferson Avenue Rylst mtg. 6s. Lindell Ry. Colst mtg. 5s Missouri RB. Co	1,500,000	1,500.000	1911	M. & N. F. & A.	108	105
IMound City ER. Co151 mtg. 08.	400,000	700,000 800,000	1910 1910	M. & B.	100	106 102
People's RR. Colst mig. 6s.	125,000 75,000 1,000,000	125,000 75.000 800,300	1902 1904	M. & N.		
People's RR. CoCons. mtg. 6s. St. Louis & E. St. L. Electriclst mtg. 6s. St. Louis RR. Colst mtg. 5s.	75,000 2,000,000	75,000	1905	J. & J.	100	101
St. Louis & Sub. RyIncome 5s.	2,000,000 800,000	1,400,000 800,000	1921		108	104
†Southern Electric ByCons. mtg. 6s. Taylor Avenue St. Bylst mtg. g. 6s.	500,000 500,000	500,000 500,000	1909 1918		106 116	108 118
Union Depot BR. Colst cons. mtg. 6s. Union Depot BR. CoCons. mtg. 6s.	1,091,000 8,500,000	1,091,000	1900 1918	A. & O.	100 121	100%
†Controlled by St. Louis RR. Co. †Controlled by Union Depot RR. Co.					ł	
Controlled by Lindell BR. Co. \$200,000 in escrow to retire 1st & 2d			l		1	
mig.	1				1	
bds.					İ	
San Francisco Cal.  Date of Quotation—June, 1900.						<u> </u>
California St. Cable RRist mtg. g. 5s. tFerries & Cliff House Bylst mtg. 6s.	1,000,000 650,000	650,000	1914	J. & J. M. & S.	114	117
Geary St., Park & Ocean RRlst. mtg. 5s. Market St. Cable Ry. Colst mtg. g. 6s.	1,000,000 8,000,000	671,000	1921	A. & O. J. & J.	126	95
†Metropolitan By. Colst mtg. †Omnibus Cable Colst mtg. 6s.	200,000 2,000,000 850,000	2,000,000	1918	A. & O.	126%	100
Park & Cliff House BBlst mtg. 6e.	850,000 250,000 700,000	200 000	1914 1912	J. & J. J. & J.	1051,	107  125
Powell St. Bylst mtg. Se. Sutter St. By. Colst mtg. g. Se. †Controlled by Market St. By. Co.	1,000,000			M. & S. M. & N.		
Washington D.C.						
Date of Quotation—June 25 1900  Belt By. Co	500,000	450,000	1920	J. & J.	<b></b>	<b></b>
Columbia By mig. 6e. Eckington & Soldiers' Homa, mig. 6e.	500,000 200,000	200,000	1911	A. & O. J. & D.	182	
Metropolitan BR. CoColl. tr. cons. 6s. †850,000 in escrow to retire 1st mtg.bds.	500,000	500,000	1901	J. & <b>J</b> .		•••••
Miscellaneous.  Date of Quotation—June 25, 1900.			ı			
Bridgeport Traction Coist mtg. 5s.	2,000,000	1,688,000		J. & J.	108	110
Buffalo (N. Y.) By. CoCons. mig. 5s. t( 'tisens' St. B. (Ind'polis).1st cons.m.5s tOrosstown St. By. (Buffalo)1st. mig.5s.	5,000,000 4,000,000	8,548,000 8,000,000 2,866,000	1988	F. & A. M. & N.	118 104	105
Columbus (O.) St. Ry1st cons. g. 5s. Consolidated Traction (N. J.)1st mtg.5s	8,000,000 8,000,000 15,000,000	2,261,000 18,965,000	1932	M. & N. J. & J.	112	118  111%
Crosst'n St. By. (Colu's, O.)lst mig.g.5s Denver City Cable Bylst mig. g. 6s.	2,000,000 4,000,000	572,000 8,800,000	1933	J. & D. J. & D. J. & J.	1111/4 115 20	115%
Denver Con. Tram'y CoCon. m. g. 5s.	4,000,000 6,000,000	922,000 4,981,000	1933	A. & O. J. & J.	80 119	<b>85</b> 119 <b>√</b>
Minneapolis St. Bylst cons. mtg. g. 5a No. Hudson Co.By.(N.J.).Cons.mtg. 5s	5,000,000 8,000,000	1,050,000 2,878,000	1919 1928	J. & J. J. & J.	110¼ 108	110%
No. Hudson Co. Ry. (N.J.)2d mtg. 5s. No. Hudson Co. Ry. (N. J.)Deb. 6s.	550,000 500,000	550,000 489,000	928	M. & N. F. & A.	::::	•••••
Paterson (N. J.) RyOons. mtg. g. 6s. Kochester (N. Y.) Rylst mtg. 5s. St. Paul City RyOons. g. 5s.	1,250,000 8,000,000 5,500,000	1,000,000 2,000,000 4,298,000	1980	J. & D. A. & O.		
St. Paul Oity RyDeb. g. 6e.	1,000,000	1,000,000		•••••	105% 108	106
181,000,000 in escrow to retire 1st and a mtg. bds. 18800,000 in treasury. Bonds guar. by		ļ	- 1			
Designation Des Co		ł			i l	
19760,000 in escrow to retire bonds of O. St. BR. Co.						
\$87,000 in treasury. \$900,000 res'ved to redeem prior liens. }\$820,000 in escrow.						
V (40.20,000 III 00.000					*With	nt'rest
ELEOTRIO LIGHT AND	ELE	OTRIO	AL	MF	<u> 2. 0</u>	08,
Boston, Mass.  Date of Quotation—June 25 1900		l				
Delaware Gas Lt. Co.,	800,000 2,025,000	800,000		J. & J. Quar.	106 157	103
General Electric Cogold coup, deb. 5s	10,000,000	8,750,000	922		116	•••••
Pittsburg Pa Date of Quotation—June 25, 1900			-			
Allegheny County Light Co6s. Westinghouse Elec. & Mfg. Co. Scrip 6s.	500,000 195,570			J. & J. M. & B.	110	•••••
Miscellaneous.—(June 25, 1900.)		4 910 000	910		100	
	4,812,000 15,000,000 5,000,000	2,188,000 1	910 993 940		109 124 1221⁄4	124
E lison Electric Light (Philadelphia) E lison Electric Light (Philadelphia) Kings Co. El. Lt. & Pow. Co.1st mig. 5s.	2,000,000 2,500,000			A. & O.	100	101
Kings Co. El. Lt. & Po. Co. pur. money 6s Milwaukee El. Ry & Lt. Co. 1st con. g. 5s.	5,176,000 8,000,000	1	997 1	A & O. F. & A.	120 1023	122
United Elec. Light & Power Co(N. Y.)	5,000,000		<u> </u>			•…
Miscellaneous.	AND 1	FELEG	R M		1	
Date of Quotation - June 25 1900	•		000		1001/2	101
American Bell Telephone			908	F. & A.		116
N.Y. & N.J. Telep & Telg Co. gen,mtg.5s Chesapeake & Potomac Teleph. Co5s.		i	pii	J. & D.	114	115
ALLIED	INDUS	TRIES	·		_	-
Miscellaneous	1	T	П	<u> </u>	1	<u> </u>
Date of Quotation—June 25, 1100.  American Electric Heating7s.	500,000	500.000				
Armington & Sims Engine Co	********		942	J. & J.	106	25 107
Worthington Pump Co	75,000		904	J & D.	115	127
Unlisted tNominal.					,	•

#### NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16; @16;c.; Lake, 16; @16; z.; casting, 16@16lc.

The Adventure Consolidated Copper Company has called an assessment of \$3 per share, payable in three equal installments.

The first semi-annual dividend of 3½ per cent. was recently declared on Easton (Pa.) Consolidated Electric stock, payable Ju'y 23.

The directors of the Amilgamated Copper Company have declared the regular quarterly dividend of 1½ per cent. and ½ per cent. extra.

The directors of the Thirteenth and Fifteenth Streets Passenger Railway Company of Philadelphia have declared a dividend of 86 per share, payable July 2.

The directors of the New England Electric Power Company have declared a regular semi-annual dividend of 3 per cent., payable July 16 to stock of record May gross earnings of the Pattsburg United Traction Company were \$169,278.

compared with \$15),448 the same month last year; net earnings, \$77,014, against \$83,(28 in 1899.

The Metropolitan Street Railway (New York) directors have declared the regular quarterly dividend of 12 per cent., payable July 16; books closed June 26 and reopen July 17.

The directors of the Cincinnati Street Railway have recommended an increase the capital stock from \$18,000,000 to \$23,000,000. Stockholders will vote upon the increase July 25.

The Boston Electric Light Company has declared a regular quarterly dividend of \$2 per share, pavable July 14 to stockholders of record June 3). Books close June 3) and reopen July 16.

Advices from St. Louis state that the St. Louis Transit Company will continue dividends in spite of the strike. The Uaton Railways Company will pay its regular quarterly dividend of 14 per cent. on July 10.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 13 a,15; New York Electric Vehicle Transportation, 6(66); New England Transportation, 34(6)37; Gramophone, 35(6)40.

The directors of the Central and South American Telegraph Company have declared the regular quarterly dividend of 1½ per cent, payable July 2 to stock of record June 25. Transfer books closed June 25 and reopened July 3.

The directors of the Eric Telegraph & Telephone Company have declared dividend No. 67, 1½ per cent., payable July 9, 1990, to stock of record June 30. The stock books will be closed from Saturday, June 33, to Monday, July 9, 1930.

The reorgan zation committee of the General Electric Autombile Company advises stockholders that unless 25,000 shares have been deposited on a certain day sale of the property will be made without regard to their (the stockholders') interests.

President Vreeland, of the Third Avenue Bailroad Company, filed a receip on June 20, in the U.S. Circuit Court for \$154,994 and two advertising claims aggregating \$4,390, thereby relieving Hugh J. Grant from the receivership of the com-

The New York, Westchester & Connecticut Traction Company, owned by the P. H. Flynn syndicate, of Brooklyn, has, after a long fight, secured its franchise in the village of Bronxville. The granting of this franchise gives the Traction Company a right of way to the town line of White Plains.

President Vreeland, of the Metropolitan Street Bailway Company states that on account of an iron-clad agreement between the Third Avenue and the Manhattan no transfers can be exchanged between the Third Avenue lines and others in the Metropolitan system for four years.

The American Telephone & Telegraph Company has declared a regular quarterly dividend of 1½ per cent, and an extra dividend of ½ per cent, payable July 16 to stock of record of June 3). Boks will be closed from July 2 to 14 inclusive. This is the first dividend for the stock since the absorption of the American Bell Telephone

A mortgage for \$500,000, te run forty years, given to the Morton Trust Company of New York, by the Plainfield G is and Electric Light Company, has been recorded in Elizabeth, N. J. The mortgage is given to cover the issue of 500 bonds of the denomination of \$1.000 each, payable in gold coin and bearing 5 per cent. interest, payable semi-annually. payable semi-annually.

The stockholders of the Consolidated Traction Company of Pittsburg, Pa., voted almost unanimously last week to lease the road to the Union Traction Company. It was charged at the meeting that the dividends paid were in excess of earnings by \$805 664. The excess was covered by a donation of 28,500 shares of common stock by the syndicate which controls the property.

The Baltimore County Water & Electric Company has recorded a 49-year 5 per cent. gold bond mortgage for \$1,000,000 to the Maryland Trust Company, tsustee. The company was formed to furnish electric current for lighting, heating and power for commercial and railway purposes in Baltimore County, and to supply water to Canton, Highlandtown and Catonsville, Md.

The Illinois Electric Vehicle Transportation Company is sending stockholders formal notice of special meeting of April 5 reducing the capital from \$25,000,000 (250,000 shares par \$100) to \$2,500,000 (250,000 shares \$10 par.) The stock is now \$5 paid and the balance of \$5 may be called in installments of \$1 per share or less at periods intervening of not less than 90 days each. The call for assessment Ju'y 1 has been withdrawn.

The Binghamton General Electric Company of Binghamton, N. Y., largely owned in Boston, has declared its regular semi-annual dividend of 2 per cent. payable July 2. The company is said to have been earning at the rate of about 6½ per cent on its \$28),000 share capital, above fixed charges. It is an electric lighting company also furnishing power for mercantile purposes. It is now adding new buildings and equipment to its plant at a cost of \$40,000 to be paid for out of surit 6½ per lighting plus earnings.

A circular has been issued by the General Electric Company announcing a special meeting of stockho'ders at Schenectady on July 17 to authorize the issue of \$4 415,000 of new common stock to redeem outstanding bonds at the rate of \$100 of par value of stock for every \$120 of par value of bonds. This is in conformity with the terms at issue of \$10,000,000 of 5 per cent. gold debenture bonds made in June, 1892, which were to be exchanged for non assessable full paid common stock at the discretion of the company. Of this amount there has already been canceled \$4,700,000 of bonds. Howing ettil outstanding \$2,900,000. 702,000 of bonds, leaving still outstanding \$5,298,000.

The stock holders of the Electric Vehicle Company at a special meeting held recently in Jersey City unanimously approved the recommendation of the board of directors that the capital stock of the company be increased from \$12,000,000 to \$18,000,000. The additional \$6,000,000, which is to be half common stock and half preferred, is to be issued for the purpose of taking over the Columbia Electric Vehicle Company, of Hartford, and the New Haven Carriage Company, which is controlled by the Columbia. The Electric Vehicle Company already owns one-half of the stock of the Columbia Electric Vehicle Company.

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#### EDITORIAL NOTES.

The Summer Convention of the Northwestern E!ectrical Association.

The summer meeting of the Northwestern Electrical Association, the proceedings of which will be found elsewhere in this

issue, was not only of considerable importance from an engineering and technical standpoint, but proved a most enjoyable outing for those who were fortunate enough to be present. Probably no more charming spot than Waupaca could have been selected for the gathering, owing to the picturesqueness of the locality and the innumerable opportunities afforded the visitors for enjoyment.

As will be seen by a glance at the proceedings a number of instructive papers were presented which dealt with topics of interest to the electrical fraternity. It was to be regretted that Mr. Wait's paper on "Street Lighting" was not read, as it would undoubtedly have elicited an interesting discussion, as was the case with several of the other papers. The members, however, will not be deprived of the benefits of the paper itself as it will appear later in the proceedings of the Association.

The attendance was fairly large, there being some eighty delegates and visitors present, while the social and entertainment features were everything that could be desired, thanks to the efforts of the gentlemen having these matters in charge.

\* \* \*

A Municipal Ownership Experiment. Persons of socialistic tendency, who advocate municipal or governmental ownership, are still being heard from. Some want

the Government to obtain control of the various telegraph companies and operate them in conjunction with the postal system. Others in various localities are begging the local municipal government to construct and operate a telephone system—as is the case in Detroit—or to purchase the street railways, and operate them à la Glasgow. Incidentally, so far as New York City is concerned, the American Ice Company might almost be said to be a municipal enterprise. But to return to our muttons. The argument invariably advanced by municipal ownership enthusiasts is, that the enterprise whatever it may happen to be, could be

run so much better and more economically. In support of this, England, France or some other foreign country is pointed to. But if it comes to pointing, why not point to Boston, which happens to be an American settlement not so far away. Regarding the municipal ownership experiment, which was made during the administration of Mayor Quincy, a recent issue of "Harper's Weekly" has this to say:

"During the administration of Mayor Josiah Quincy, it was announced that he entered upon . a policy that would save the taxpayers of Boston thousands of dollars. Having become convinced of the wisdom of municipal ownership, the panacea of the socialists for most of the evils of the body politic, he proposed to cut off the individual and corporate leeches that supplied the city with various commodities. With this beneficent end in view, he had a municipal ice-plant and a municipal printing office established. For the care of the city's horses, a veterinary bureau was added to the municipal departments. For other work wheelwrights, blacksmiths, carpenters, painters, letterers and a whole army of other employes were hired.

"But in less than two years, the attractive theory upon which this change was based has been completely discredited. Instead of saving the city thousands of dollars, the new departments and bureaus have added thousands of dollars to the city's Indebtedness. Mayor Hart took office, he was called upon to sign vouchers for work that appeared to him to be needlessly expensive. Upon investigation he found that the city was paying for labor and materials far more than the current rates. For example, he found that the electrical equipment of a ferry-boat operated by the city, which should have cost only \$6,800, had cost \$10,200. The electrical work on a city building for nurses, which should have cost \$1,528, had cost \$4,754. For work on a city armory, which should have cost \$2,600 the city had to pay \$6,700.''

After citing numerous other cases of exorbitant charges, such as the above and that ice rose from \$3 to \$6 a ton, the article continues:

"If any one supposes that the increased cost of those new bureaus and departments was due to dishonesty in the ordinary sense of the word, we hasten to correct the error. It was due simply to the extravagence and inefficiency that appear to be inseparable from the municipal management of business matters. The new bureaus and departments were loaded

down with political appointees. In order to get money enough from the common council to carry on their work the chiefs had to appoint such men as the aldermen demanded. A striking example of the kind of pressure to which they were subjected comes from the printing office. When a notoriously unsatisfactory employe was dismissed he went to the alderman in his ward, and after an interview with him returned to the office and said: "Alderman Blank of South Boston says I'm to go back to work; but if you make any kick about it, I'm to have your place, and you go. See?" The superintendent of the office did see, and reinstated the worthless fellow. But what was true in this instance has proved true in numberless other instances. It is estimated that the removals that Mayor Hart has already made have saved the city from \$500,000 to \$600,-

The writer of the article in question goes on to state that civil service reform was no cure for this evil, owing to the many ways an in-·fluential politician can get a person appointed without its being necessary to undergo the ordeal of an examination. The article then concludes as follows:

"Of course the defenders of municipal ownership will say that under different conditions the result would have been different. But as human nature is virtually the same the world over, we may conclude that the same outcome would follow the same experiment in any other city in the United States."

This fiasco in Boston should furnish advocates of municipal ownership with food for thought. Unfortunately, a large majority of those who cry the loudest for the Government and municipalities to take over street railways, lighting plants and telephone exchanges, are not of the kind that are much given to deep meditation.

Fair Protection of Trade and Commerce many rabid measures Against Unfair Monopolies.

After taking time to reflect over the very that were introduced in Congress during the session recently

closed against trusts, monopolies, combinations in trade, etc., it is well to stop and consider just what steps could and should be taken to protect the public from all restraints and monopolies that may be unlawful, without detriment to trade as a whole.

It would seem in the first place, as though the most important legislative step should be directed against the cause of these evils in business, and not at business itself. For instance, when a bill is introduced which seeks to declare illegal any association or corporation engaged in production and the carrying on of any business for the purpose of controlling or monopolizing the manufacture or production of any article of commerce, as was the case during the session just ended, it goes a step too far, in that the prohibition would cover not only the unfair monopoly and unfair control that is obtained by unfair means, but also the fair control which any manufacturer, miner, or other producer may seek fairly, and perhaps obtain, by means of new machinery, processes or inventions; by his own trade secrets, or by ownership of natural facilities such as mines and water powers, or by any other conditions which may give him success in his particular business and also a practical control of the article that he produces.

To be reasonable and fair it would seem that

the prohibition as to production should be limited either to monopolies obtained by unfair means, or that it should be directed to unfair methods of sale, trade, transportation and commerce, by which it is claimed that certain unfair monopolies have been fostered and maintained. Claims are made, and in part substantiated, that special rates, special freight rates, special privileges as to cars, storage, switching, telegraphing, and prompt delivery of goods have been obtained by certain monopolies, without which they would not have been able to secure a permanent foothold, and by so doing crowd out competition.

All of these matters are clearly within the limits of the interstate commerce jurisdiction of the United States, and if that jurisdiction is not equipped with sufficient legislative power to cope with the situation as it exists, then the proper step would seem to be to have that legislative power extended in order that it may be in position to meet any emergency. and such a measure should receive concerted action by merchants and manufacturers during the interval between the sessions of Congress, so that when that body convenes again. it would be in a position to introduce a bill that would be liberal in its ideas, and yet comprehensive enough to cover the existing evils.

It would seem that much could be done in this direction by giving absolute publicity to all transportation contracts, liberal provisions for civil actions for the recovery of unlawful rebates, and suitable penalties from those who have obtained the benefit therefrom.

The measure thus to be introduced would be considered as too important to contain any provision that would attack any of the great productive energies of the country, but it should be framed so that it would seek to prohibit unfair business methods of sale, transportation and commerce, such as are well-known to be at the disposal of some producers to-day. should contain provisions that will meet the evils, the boycotting of rivals or of those who deal with rivals, the rebates by common carriers, special privileges and rates, and it should make it obligatory that there should be a necessary degree of publicity of the business of common carriers as will enable these evils to be detected, and allow each man who is injured to obtain full protection and redress in the courts

Such a measure can be framed; such a measure should be framed by those interested; and if it is framed and introduced at the next session of Congress it is fair to assume that it would receive the sanction and support of a sufficient number of the members of both branches of the legislative assembly to become a law, and thus secure the object hoped for; and this will never be the case with extreme measures such as have been introduced during the session just ended.



The transformation of the street railways of the country from horse power to electricity has been the work of scarcely a decade. The close of 1899 found in this country 871 roads with upwards of 19,000 miles, of which less than 500 miles were of the old-fashioned system. New England has reduced her mileage of horse railways to only eight miles. The total mileage of street and elevated railways at the close of 1899 was 19,213 miles; number of cars, 58,736. Capital stock, \$1,023,819,978; funded debt, \$777,-862,571: total, \$1,801,682,558. The increase of liabilities of 1899 over 1898 was \$198,682,899 for

b)th capital stock and debt, indicating a year of activity. New England's share in the above was 2,997 miles of railway, 10,652 cars, with capital stock and debt of \$123,673,000. Massachusetts occupies the commanding position in New England with 1,625 miles of railway, Connecticut has 492 miles, Maine 279 miles, Rhode Island 181 miles, Vermont 71 miles, and New Hampshire only 57.

#### UNDER THE SEARCHLIGHT.

#### Notes and Comments on Various Topics.

JOHN M. ROACH, president of the Union Traction Company of Chicago, has outlined to the street railway commission a plan for a gigantic subway to relieve street traffic in that city. Many millions of dollars will be necessary for the completion of the project. The plan involves an equal sharing of the expense by the two traction companies operating surface trains into the heart of the city.

THE latest application of electricity for use aboard ship is a patent inclinometer, designed to register the exact roll or list to port or starboard of a vessel at sea or in harbor. It is claimed that this instrument is extremely sensitive and absolutely unerring in its indica-

WE are in receipt of an attractive Fourth of July souvenir from the American Electrical Works, Providence, R. I. On the front cover is shown a very small boy, lighting a very large fire-cracker, accompanied by the appropriate inscription, "When things happen." On the third page appears the dome of the capitol with a flag-staff near it emerging from a thick grove. The latter serves to hide "old glory," which may be run up to the top of the staff by the simple process of tightening a string which passes through an eyelet at the top of the pole, and emerges at the back of the souvenir. In the sky the following command appears: "Run up 'Old Glory 'at 12.01 A.M., and don't take it down till 11.59 p.m., and make things hum all the time."

In a paper read before the British Dental Association recently, Mr. T. S. Carter described an electrical motor for drilling holes in the jawbones in order that wires may be used to keep a fracture in place. The motors could be constructed for use either with continuous or alternating current. He then described various operations for fractured jawbones in which the motor had been used, and stated that he considered that it might be used with very great advantage in trephining and other operations now done by hand.

News from Athens, Ga., states that the 1,000 horse-power electric plant at Tallahasse: Shoals will be completed in a short while. The power-house will be sold as soon as finished, and it is rumored that a large cotton mill will be erected there.

In a report recently forwarded to the State Department at Washington in regard to the use of electric power in Greece, United States Consul McGinley at Athens says: "From reliable sources, I have learned that the Athens & Piraeus Railway Company must, according to conditions in its franchise, adopt electricity as the motive power for its trains within the next



three years. This road extends from the quay in Piraeus to the business center of Athens, some five miles, three-fourths of a mile of the distance being through a tunnel under a portion of the city. A Belgian company which owns and operates a steam tramway between Athens and Piraeus, via Phaleron, also wishes to adopt electric power for its trains, but how soon it desires to make the change has not been learned. Each road has a very large passenger traffic, especially in the summer. A company of Athens has been trying to secure the contracts for fitting these roads with electric power. I have been informed that the president of the first-named company has gone to the Exposition at Paris to examine the electric contrivances on exhibition there, and to endeavor to secure the best possible equipment for his road,"

THE Magellan Straits will be connected by wireless telegraphy with the rest of the Chilian Republic.

It is stated that an electric locomotive in a Canadian coal mine, shows a saving over mules of \$2,528 in 200 days, and an electric pump in the same mine shows a saving over steam pumps of \$1,573 in 970 days.

GENERAL GREELY has been informed that the Signal Corps wireless telegraphy stations have been established and are in successful operation between Alcatraz Island, San Francisco Harbor and Fort Mason. It has been impossible to maintain cable communication between these points, owing to interruptions by shipping, incoming vessels dragging their anchors and injuring and misplacing the cables continually. This is the first system of wireless telegraphy established as a practical working system where other means have failed.

THE immense airship, built on the Lake of Constance, near Friedrichshäfen in Germany, and which was referred to in the issue of Electricity of November 15, 1899, has been completed, and was given a trial a few days ago. It traveled with five persons from Friedrichshäfen to Immenstadt, a distance of about fif teen miles.

A DISPATCH from Washington states that Supervising Inspector General Dumont has decided that automobiles operated by gasoline engines cannot be carried by freight or passenger steamships. This decision was made upon inquiry by the Jamestown & Newport Ferry Company. Mr. Dumont decides that section 4,472 of the Revised Statutes absolutely prohibits the ferriage of naphtha, benzine, etc., under any circumstances, on either freight or passenger steamships, which includes ferryboats, and therefore would prohibit gasoline automobiles when their tanks are supplied with gasoline.

A TELEPHONE system is in operation in Egypt, with headquarters at Cairo, and branches at Alexandria, Port Said, and other towns, says the London "Electrical Engineer." The company has a trunk line running from Cairo to within a few miles of Alexandria, but has been unable to complete it on account of Government opposition, which is based on the ground that the telephone line would diminish the State receipts from the telegraph system. The telephone company employs male operators only, and these are required to be expert

linguists, having to speak English, French, Italian, modern Greek, and Arabic. There is also in Cairo an electric lighting central station supplying the very respectable output of 35,000 10-cp. lamps. Brown-Boveri alternators, giving 2,000 volts at 40 cycles, are direct driven by Sulzer engines, and the distribution is through concentric cables. There are 90 transformer sub-stations, at which the current is stepped down from 2,000 to 100 volts.

The newest and most important underground electrical railroad, running from the Bank of England to the Western suburbs, beneath the central portion of London, was opened by the Prince of Wales on the afternoon of the 27th ult. in the presence of a distinguished gathering. The Prince greatly admired the handsome American cars, similar to those in use on the New York elevated railroads.

Information from Washington, D. C., states that Major G. W. S. Stevens, in command of the new signal corps post, is now experimenting with several automobiles with a view of establishing their practicability as balloon wagons and as substitutes for the other wheeled craft of his aeronaut division. Our adoption of an automobile balloon train would mark a distinct epoch in military aeronautics. The multiplicity of storage batteries on horseless wagons would supply ample electricity for balloon telegraphy and telephony.

THE British Administration advises that the Western Union telegraphic code and international cable directory (Universal Edition), 1900, having been deposited at Aden by the Japanese Government, and chosen by the Canadian and United States Governments, may now be generally used for telegrams to and from Zanzibar, Seychelles, Mauritius, Madagascar, British and German East Africa, Mozambique and Laurenzo Marques.

An electrical process for smelting iron ore has had a trial on an extended scale in Italy, no less than \$180,000 having been invested in a plant for the manufacture of 4,000 tons of iron a year. The works are at Camonica, in the north of Italy, where water power is very cheap, an electrical horse-power for a year, or 8,760 working hours, costing only about \$10.50 to generate. The iron ore is ground to a fine powder and intimately mixed with ground coke and limestone. The mixture is ground into small briquettes with a suitable binding material, such as tar, and heated by the electric current in suitably designed furnaces. A continuous output results, the slag and iron being drawn off from time to time. As compared with the old process, wherein the heat is supplied by burning coke in a blast furnace, the cost is reduced nearly \$12 a ton for the finished product, which is a high carbon manganese steel of great purity. Of course the figures given are based on the cost of coke, etc., in Italy. They would be much less in this

Growing interest in automobiles has led to close rivalry and great perfection in the construction of automobiles in France. This is true of all forms of automobiles, but particularly so of those using electric power. At present both the long distance and high speed records for electric automobiles are held by members of the Automobile Club de France. M. Krieger has covered 152 kilometers (94)

miles) on ordinary roads without recharging the batteries of his machine, the run being at an average speed of ten miles an hour. The high-speed record belongs to M. Jenatzy, who made a kilometer from a standing start in 47.3-5 seconds, and with a running start, in 34 seconds—a speed of sixty-five miles an hour.

A Portuguese paper gives details of an invention which is to greatly facilitate fox and badger hunting. The device consists of a small electric lamp fixed on to the collar of the dog who is to enter a burrow. The effect of this light, which is to be colored, is expected to have the effect of frightening the animal, which is used to living in a dark hole. It then tries to escape out of the burrow and the hunter bags him.

Officials of the Evanston Electric Street Railway of Chicago have decided upon the cause of the derailment of their cars of late. Bugs, they assert, are responsible for the accidents. Within the last few days several cars on that line have jumped the track. In each case it was in the immediate vicinity of an arc light. The derailment, it is claimed, was caused by hundreds of carcasses of bugs which have fallen dead on the tracks, after hovering about the arc light. This discovery was made by an employe of the road who has had experience with grasshoppers in Kansas.

# The Northwestern Electrical Association Summer Convention.

The delegates to the Northwestern Electrical Association Summer Convention began to gather at the Grand View Hotel, "Chain o' Lakes," Waupaca, Wis., on Monday afternoon and Tuesday morning, June 25-26, so that when President Norcross called the meeting to order at 11 A.M., June 26, a very respectable number of delegates were in attendance. The President then delivered the following address:

Ladies and Gentlemen-It was at our last annual Convention that the voice of our Lord persuaded us to build our summer tabernacle on the banks of the clear lakes and flowing streams near Waupaca. The eloquence of that persuasive voice still rings in our ears. We have eagerly looked forward to the day when we should be made to lie down in the green pastures, and be led beside the still waters of that fair Beulah Land so vividly described upon that occasion. The Lord's promise and our firm faith in its fulfillment have made the intervening days seem shorter and brighter. We are here. Nothing that was told to us compares with the beautiful reality. The lakes are clearer and more numerous than we imagined, the air is laden with the spicy perfume of wild flowers, the charming seclusion of "deep-tangled wild-wood" which we find on the lake banks, exceeds the picture which was presented to our admiring gaze at the Pfister Hotel. We have wandered over the hills and through the dales, and have been fascinated by the varied scenery, we have breathed the pure atmosphere, have quenched our thirst from the clear water of these gem-like lakes, until we are renewed by the zeal, vigor and spirit of eternal youth. I have no doubt but that the Indian brave wooed his dusky bride in the sweet, leafy retreats about these lovely akes, and I am equally certain that his im-



perial successor, the white man, in these same cool, shady, enticing bowers, has found courage to woo and win a fairer, sweeter maiden. (Applause.) It seems to me that the god of day wears a brighter smile of gladness as he brings a fresh morning to this enchanted valley, and I can easily believe that his departure over these western hills is accompanied by a benediction and a promise. Standing in the presence of so many beautiful and wonderful objects of nature's handiwork, we may truthfully unite with the poet in saying:

"Know ye the land of the cedar and vine,
Where the flowers ever blossom, the beams ever shine.
Where the tints of the earth and the hues of the sky,
In color though varied, in beauty may vie."

We are glad to be here. We are thankful for the opportunity to shake hands with the enterprising men who have discovered for us this charming spot of nature's grand domain. Wisconsin is justly famous for its beautiful summer resorts, but among all its beautiful places there is none fairer or better than the Chain of Lakes about Waupaca. (Applause.)

Mr. Gerhard M. Dahl, City Attorney of Waupaca, then delivered the address of welcome, as follows:

Ladies and Gentlemen-It would be a superfluous task for me to express to you the gratification which it affords me to come here to-day and greet you on behalf of this community. Press of work prevents the chief official of the city of Waupaca from appearing here in person, and consequently this pleasant task has been delegated to me. I am not going to detain you for a long time and am not going to make a speech. I simply wish, in behalf of the city and county of Waupaca, to greet you and to bid you welcome to this place. I know that you are going to have a good time-I can tell it from looking at you. In fact, while sitting on the porch a short while ago, I heard a lady remark, "I never saw such a jolly lot of men in all my life." I never saw so many fat men in all my life. (Laughter and applause). I do not know whether it is because of the peculiar connection which you have with electricity, or not, but whatever it may be, such appears to be the case. This souvenir emblem which you all wear to day is symbolical of the first dim breathings of electrical progress. When Benjamin Franklin experimented with the key he had but a very slight idea, I take it, of the wonderful strides which would be made in electrical progress within the next century. To you men who are daily engaged in electrical matters, I believe the wonderful strides do not appear so appalling as they do to us laymen. I will not undertake to describe any of these remarkable improvements which have been made. O course you are all more familiar with them than I am-in fact, I do not believe that I would know the difference between a Phoenix generator and a motor armature. Nevertheless we laymen take a great deal of interest in this work which you are doing. You men are now here together in convention assembled to discuss principles and questions which are pertinent to your work. You are peculiarly engaged in enterprises which are, if not entirely public, are quasi-public, because the public at large are interested in the particular matters which you discuss, such as electric railways, electric lighting, etc., because on their work to a large extent depends the comfort, welfare and interest of the public. Gentlemen, you have come to these beautiful Waupaca lakes to hold your Convention, and we greet you. We are glad

that you are here, and we welcome you in the name of allthe people of this county. We give you the freedom of the city and the county, and the key, do with it what you will. You have come and we are yours. (Great applause).

The President—Mr. City Attorney, on behalf of the ladies and of the gentlemen who compose the Northwestern Electrical Association in convention assembled, we thank you cordially for your welcome.

The journal of proceedings of the Eighth Annual Convention of the Association held at Milwaukee, Wis., January 17, 18 and 19, 1900, was duly adopted as the minutes of that Convention, and the reading of the minutes dispensed with

The President appointed as membership committee, Mr. F. A. Copeland of La Crosse, Mr. W. Worth Bean of St. Joseph, Mich., and Mr. E. L. Debell of Sheboygan, Wis.

The report of the Legislative Committee was deferred until later during the Convention.

The report of the Committee on Investigation of Correspondence Schools, was deferred until the next Convention.

The Secretary then made a report on behalf of the badge committee. He stated that a silver button badge had been selected, which could be obtained for 75 cents each.

Mr. Lord — The Waupaca Convention Committee has nothing to report further than what you see. The members present can make their own reports and I will take up no more of your time. The report made by Mr. Lord, as an evidence of appreciation of the work done by him and his committee, was unanimously adopted by a rising vote.

The Secretary—The minstrel performance will be given at the Waupaca Opera House to-morrow (Wednesday) evening at 7:30, and the ball will be held here in the Convention Hall Thursday evening. I wish to say that the greater part of the expense for our entertainment has been borne by the Chicago associate members. I think it is proper and just to state that here. (Applause.) We have also arranged for the services of the Waupaca Veterans' Home Band.

The meeting then adjourned.

Tuesday—Afternoon Session.

The Convention was called to order at 2 P.M. by the President.

A number of applications for membership were reported favorably by the Membership Committee, and the applicants duly elected members of the Association.

Mr. W. Worth Bean, of St. Joseph, Mich., then read a short paper entitled "Advantages of Recording Watt Meters on Switchboards," which elicited a lengthy discussion, in which Messrs. Baker, Copeland, Ferguson, Grover and others took part.

The next paper, "Wet Steam," was read by Mr. William H. Edgar. This was followed by an interesting discussion in which Messrs. Schott, Copeland and McMaster took part.

A vote of thanks was unanimously tendered to Mr. Bean and Mr. Edgar for their able, interesting and instructive addresses.

The meeting then adjourned.

WEDNESDAY-MORNING SESSION.

The Convention was called to order by President Norcross at 10 A. M.

Mr. W. Worth Bean acted as Secretary, owing to the unavoidable absence of the Secretary on business for the Association.

A telegram was received from Mr. W. H. Frund regretting his inability to be present.

Mr. H. II. Wait being absent his paper on "Street Lighting" was not read.

Mr. Louis A. Ferguson, of Chicago, presented a paper on "Storage Batteries for Small Stations," which brought forth a discussion in which the President, and Messrs. Copeland, Swenson and the author took part.

Prof. B. V. Swenson then read a paper written by himself and Prof. Richter on the subject of "Practical Testing of Small Lighting Plants,"

A unanimous vote of thanks was then extended to Profs. Swenson and Richter.

Mr. F. E. Hatch, president of the Hatch Electric Smelting Company of Green Bay, Wis., next addressed the Convention on the subject of his patented electric smelter, in which he said: "My process is one of roasting, burning or smelting by electric heat. I multiply my heat 42 times over what it is in the ordinary form of furnace."

The meeting then adjourned to meet the next day.

THURSDAY-MORNING SESSION.

The Convention was called to order by the President at 11:30 o'clock.

Prof. George D. Shepardson, who was absent, sent in his paper on the subject of "Why Some Municipal Plants Do Not Pay," and upon motion it was unanimously decided to print the paper in the transactions of the Association.

Mr. Copeland—I am under the impression that the Secretary-Treasurer's office will run a little bit short. The Secretary has done a vast amount of work this year and I know that the income of the office is really insufficient to cover the expenses, and I wish to offer this resolution:

Resolved, That the sum of \$200 be and hereby is appropriated for the use of the Secretary-Treasurer for the year 1900.

The resolution was unanimously adopted.

The Secretary—I think it is generally understood among the members that the office of the Secretary-Treasurer and the emoluments thereof hardly warrant any one feeling a large financial interest in the Association, and that the work has been, so far as I am concerned, purely a labor of love and interest in the Association. I feel of course gratified at your action in the matter, which I take as an indirect compliment to myself, and beg to assure you that up to fifteen minutes ago I had not the slightest idea that any such action was contemplated or any such resolution proposed to be offered. (Applause.)

Mr. Copeland—I did not consult Mr. Mercein, on this subject at all,

The Secretary—I move that there be spread upon the record a vote of thanks of this Association, its officers and members, to Mr. I. P. Lord and Mr. W. B. Baker, for their untiring courtesy connected with this Convention; also to Messrs. James Wolff, W. W. Low and George S. Whyte for their individual efforts to make this Convention a success, and finally to the ladies of Waupaca for the many courtesies that they have extended to the Association. The motion was carried.

The Convention then adjourned until January, 1901.

#### PERSONAL MENTION.

Mr. Albert C. Farrand, formerly of Oshkosh, Wis., was recently elected city electrician of Atlantic City, N. J.

Mr. Edgar W. Brown of Troy. N. Y., will sail from Cape Town, South Africa, July 11 for home. Mr. Brown, who was formerly with the General Electric Company of Schenectady, has been in South Africa for a year and a half, tilling the position of electrician for the company which operates the tramway system at Cape Town.



#### AUTOMOBILES AS A SOURCE OF REVE-NUE FOR CENTRAL STATIONS.\*

BY ELMER A. SPERRY.

(Concluded from page 390.)

In electric road traction the consideration of prime importance is the battery. What is its efficiency, its durability, and above all, at what cost will it produce a ton mile?

We will confine our attention in the following remarks to that class of storage battery known as the lead-lead element. These batteries are of two general kinds: the one having its active material formed or developed from metallic lead—Planté's process; the other having its active material mechanically applied—the Brush or Faure process.

A prominent German writer, giving results of recent tests, states that an average carriage with a Planté battery would run twenty miles per charge, the battery weighing 1,260 pounds, yielding 2.8 ampere hours per pound, 5.25 watt hours per pound, and requiring fifty-one pounds of battery per ton mile, whereas, with the Faure battery of the same capacity he found the weight to be 980 pounds, yielding 3.6 ampere hours per pound, 6.5 watt hours per pound, running the same carriages an average of twenty-nine miles requiring thirty pounds of battery per ton mile, showing a life of 3,000 and 4,000 ton miles. This simple report reveals the fact that batteries of different weights, though possessing the same capacity, will propel the same vehicle different distances, requiring a marked difference in the pounds of battery per ton mile. One of the highest engineering authorities on storage batteries recently stated:

"The advantage which would follow the introduction of a high-capacity cell would not be merely the extension of the radius of action of the electrical vehicle, but would be a lengthening in the life of the battery itself. This is brought about by the fact that it would almost entirely remove the most powerful cause for deterioration,—that of over-discharge. Present batteries have twenty to thirty miles capacity. In the case of a battery capable of propelling a vehicle sixty miles on one charge, only the most inexcusable carelessness could bring it to the state of complete discharge, for ninety per cent. of the discharges would be for distances of less than thirty miles. Under these circumstances the battery would be seldom discharged over fifty per cent. of its capacity, a condition of affairs which would insure a greatly increased life, probably between four and six times the life under present conditions.'

The importance of proper manipulation, also proper adjustment of the capacities to the work to be performed, is here emphasized. Not only will it be seen that the life of the battery is improved, but, what is more important, the cost per ton mile is also materially reduced. In this connection, it will be interesting to investigate the relation of the cost of operation per mile due to this factor, namely, the storage battery. Very little, if any, literature is available on this all-important subject, and, in fact, so little experience up to the present time has been available, and so little information has been given out, that it is not surprising that only meager records of this function exist.

Beginning with the supposition that the present heavy batteries, namely, those yielding about two and three-fourths amperes per

pound, are possessed of a given life, certain deductions will be made by introducing series of variables yielding results and data, the bearing and significance of which is of more than passing interest.

Before entering upon a more detailed discussion, it might be well to state the result of more general observations in this line. The desirability of the electrical system of traction, the extent of its adoption, and consequent extent of the demand of the central station for supply, will depend upon the earning capacity that can be demonstrated. The value and present cost of the same work are known factors. The question remains, what is its cost under the new conditions? Under practical conditions of operation, a battery having a life equal to 1,000 ton miles will drive a vehicle weighing a ton 1,000 miles, or a vehicle weighing two tons 500 miles. For purposes of illustration of the possible cost of this factor let us assume that this battery costs \$500. It will then be seen that each cab mile covered in the latter instance will cost one dollar, which would, of course, be prohibitive. Nevertheless, it is a fact that batteries have been made and marketed, and, what is still more serious, others have been so misused in practice as to have a life less than above assumed. Suppose the average life of the battery to be five times that assumed, the new cost per cab mile will be twenty cents.

In the early stages of any industry, conditions are often found to exist, the practical results of which, though startlingly disappointing, are finally met and overcome, and especially is this true where the result is an important one, and where capital and skill are available. This is most certainly true of the art under consideration, and within the past year advances have been made that are favorable in the extreme; advances that are destined to reverse the adverse verdict, and to place the art of electric road traction by batteries high above possible criticism.

Taking unity as a basis of the battery factor in the cost per mile, we will proceed to introduce the variables as to weight and cost, and to note the results. Suppose we assume that the heavy battery is about half the total weight carried. Engineer Maxim, in his Milwaukee paper, says forty-five per cent.; this is close enough to fifty per cent. for present purposes.

First, assuming a battery of same capacity to weigh one-half. It will at once be noted that the vehicles carrying battery of one-half the present weight can easily be made one-eighth lighter, giving a total reduction of weight of one fourth plus one-eighth or three-eighths. The capacity remaining the same, the lighter combination, or new carriage, will be propelled unity divided by 625, or 1.6 times its former mileage. This factor—1.6—represents the new mileage, yielding the new cost per mile of five-eighths, or .625. In the above calculation it has been assumed that the lighter battery costs the same as the heavier battery, or twice the cost per pound.

Light battery costing the same per pound as heavy battery. The cost is now reduced to one-half, but the battery is of the same capacity, and will propel the vehicle 1.6 times its former mileage. Introducing this factor, we have a new cost per mile of less than one-third (.31).

Important reductions in cost per pound of battery have been made during the past year. Let us now assume the following:

Light battery costing one-half per pound of the heavier battery, the cost becomes at once one-half of one-half, or one-fourth; but we must still introduce the mileage factor of 1.6, which yields 1.5, or a cost per mile of one-seventh (.155).

In the above calculations we have assumed only the original life of the batteries, with no renewals. It is found in practice that vehicle batteries with the renewals cost about one-half the first cost of battery, and the life by renewing is extended half the former period; a condition, it will be observed, that does not alter the cost factor per mile.

It has been found that a battery when exhausted weighs as much, and is possessed of its full quota of chemical Pb., and though heretofore it has been difficult to recover any portion of its original cost, at present, with the batteries of one maker at least, it is possible to recover and re-use the exhausted material over and over again at slight additional cost, the original total investment in lead being practically the only investment required.

Assuming, now, that these renewals be made at half original cost, and that the batteries be carried through only four such renewals, it is found that the whole battery cost and energy produced throughout its extended life is sixtenths of that during the first period, which alone has been considered above. Introducing this factor in the last result, we find a cost per mile of practically one-eleventh (.094).

Advances in the art have, however, gone further than reducing the weight of battery by one-half, and it is now possible to obtain on the market batteries of excellent life that have the original capacity with one-third the weight. With such a battery a vehicle required to carry one third weight of battery can easily be made one-sixth lighter, making a total reduction of the combined weight of one-third plus one-sixth, or one-half. This battery, having the same capacity, will push the lighter vehicle a distance of unity divided by one-half, or twice the mileage possible with the heavy battery, or at a rate of cost per mile of one-half (.5).

The last result assumes that the light battery (one-third weight) costs the same as the heavy battery.

Light battery costing same per pound as heavy battery, the weight being only one-third the cost will, therefore, at once be one-third. But it will still drive the carriage twice the mileage, yielding a total cost per mile of one-sixth (.166).

Light battery costing one-half per pound, there being one-third the weight, the cost will at once be one-sixth; the battery, still having the original capacity, will propel the carriage twice the mileage, as above, and will yield a total cost per mile of one-twelfth (.0833).

Carrying this battery through a course of four renewals under the conditions above stated with reference to renewals, we find that through the extended life of the battery the cost per mile has been  $(.0833 \times .6 = .5)$  equal to one-twentieth (.05).

The realization of these sweeping reductions in cost is all-important. The results are evidenced as follows: Vehicles with live load, total weight of one and one-third tons, have yielded 1,000 miles per discharge with batteries weighing less than 1,000 pounds. Partial realization of the desirable features yielding the results above given, will work economies that are proportionate. The above calculations are given not only as indicating the high point that has been attained in the development of traction batteries, but also as indicating the line in



<sup>\*</sup>Paper read at the Twenty-third Convention of the National Electric Light Association, Chicago, Ill., May 22-24, 1900.

which future effort should be directed for still further advancement.

As showing the position of this country in this most important work, and especially the recent developments and advances on this side, reference will be made to the competitive tests recently concluded in Berlin in connection with the International Motor Car Exhibition in that city, which were productive of important and valuable data regarding electric motor vehicles. Not the least interesting is the average weight of battery to the ton mile. This figure is named as twenty-eight pounds per ton mile, but recalculation shows it to be nearer thirty-pounds.

It will be seen in the test recorded from the German authority quoted earlier in the paper. that the values of thirty and fifty-one pounds per ton mile were assigned. Values in this country for vehicles most frequently range between twenty-eight and fifty pounds. As the result of experience, the author would state that this value should be held at or below ten, and vehicles that can easily show this value are in daily commercial service; which makes an extremely favorable showing. So light a battery lends itself readily to the duplication of batteries referred to as creating the necessary diversity factor. The results of the battery tests. so-called, made under the auspices of the Automobile Club of France, recently concluded, indicate that the best results may be expected from batteries in which the active material is retained with, or its retention in place upon the grid is materially aided by, the use of proper envelopes; this being especially true with traction batteries. Furthermore, every means should be employed to shield the battery and to insulate the same thoroughly, not only electrically, but especially against jar and vibration. It has been demonstrated that concussion and molecular vibration are factors tending most seriously to disintegrate the elements. A plan has been devised that seems destined to secure this result: it affords a cushion support for the individual plates by the simple device of rendering the cap of the plate supports within the receptacle elastic and yielding, thus allowing it to perform the function of a cush-

As a result of the past five years' observation of and close contact with this most engrossing work the author can assure station managers that the time has arrived when traction batteries, under conditions of vehicular traffic, are making excellent records and showing commercial results that are most satisfactory. At last this element of great mystery and uncertainty, and the one that has beclouded the electric vehicle world from the first, has cleared from the horizon, leaving only known factors, with which we may deal with certainty.

The success of the electric vehicle being thus assured, a steadily increasing demand for current is sure to follow, which will result in large business. This field belongs to the central station by right of discovery; but history repeats itself, and the opportunity will be lost if the territory is not occupied and its resources developed. The central-station organization and equipment is the proper guardian and natural source of expert service and attendance for both battery and machinery, and will naturally be looked to to foster the interests that it shares with the vehicle operators. It has not been demonstrated that central station owners should not be the principal operators themselves. Much can be said in favor of such a combination. In any event, they

should closely ally themselves with this important industry, and the earlier a practical experience is had by the station men themselves, the sooner will they understand the needs of the business, and the sooner will they be prepared to guide their patrons into a successful and widespread use of electric road-traction.

#### OUR DUTY TO EACH OTHER.\*

BY C. W. KLINE.

My text is our duty to each other, and I deem it proper to give a brief review of the telephone field in the United States from its inception down to the present.

A great many years ago the telephone was invented, but was very slow in coming into use because of the great expense attending its installation. It was a luxury that only the rich could indulge in, and the service was far from satisfactory. The threads were gradually but surely gathered together under one monster head, an absolute monarchy, and it thrived and lined the pockets of its owners with great wealth; it reached out in every direction and embraced every town of any importance in the United States. The monster monopoly, known as the American Bell Telephone Company, owned all the patents, or at least thought it did, by which a telephone could be manipulated, and tried to so shape its affairs that it could maintain this monopoly for a long time to come. It was autocratic in its terms and conditions and careless of all complaints made by the business world, to whom the telephone gradually grew to be a necessity; and the result in the telephone world is the same to-day as it always has been and always will be when corporations or individuals try to over-reach themselves and by reason of their monopoly compel exorbitant charges for inferior service. The business world begged for better terms, complained of the extortion, asked for fair treatment and lower rates, but the monopoly was so firmly established and controlled the field so absolutely that for the time being nothing could be done. Many of the men interested in the monopoly saw the handwriting on the wall and tried to adopt a more liberal, businesslike policy, tried to get better service and lower rates, but they were in the minority and were not able to accomplish anything. A few years ago some of the Bell patents expired, and very soon companies were organized, charters applied for, capital invested for the purpose of establishing independent plants and securing to the general public first-class service at rates the community could afford to pay. These operations have been going on over the length and breadth of our land, and very soon at the present rate of building lines in the whole country, in every city, town, hamlet, village and even farm will enjoy the blessing and privilege of telephone service at rates they all can afford to pay.

Now as to our duty to each other. Our first and paramount duty to each other is to stand together, united in favor of every interest that effects our cause, and as a means to bring about such a union, the Independent Telephone Association of America was organized some years ago from among the independent companies then established, and it has already done wonders to advance the independent telephone interests in the United States; and

our very first duty after securing our charter for an independent telephone company is, to apply for admission to membership in this great Association, pay our dues and sustain its board of control. We have a common business foe to oppose us in every step we take, an opponent with vast experience, who is perfectly familiar with the whole field, and who will take all the advantage possible in every weak point of our armor, an opponent that will at every step of our existence try to disorganize us and keep us disunited. Let me give you an illustration of their work. I am the president of a small independent telephone company at Hazleton, Pa., known as the Anthracite Telephone Company. We have about five hundred phones in lower Luzerne, Carbon and Schuylkill Counties, and among those 'phones we happened to get a few bridged instruments. The octopus with one of its tentacles found them, and at once asked the United States Court for an injunction against us for infringing the Carthy patent. The result of that contest is know to the whole telephone world. How was it brought about? I will tell you. (1) The American Electric Company and the Via duct Manufacturing Company, who sold us our instruments, stood by the letter and spirit of the contract with us, and united for defense, and over and above it was the powerful arm of the Independent Telephone Association of America, of which we were members, who employed counsel, secured testimony and presented to the court such a masterly defense that the enemy was completely routed. No one company, no one manufacturer, no not several of them joined together could possibly withstand the fight with the Bell. They can harass, annoy and drive us from the field, and our only remedy is to stand together, because our interests are in common; every independent telephone company in the land should stand by the Association. A small initiation fee, and a small per capita charge for each independent telephone in the United States will create a fund out of which it will be possibe to defend every point attacked. Whether the independent telephone company is rich or poor, we owe as a duty to ourselves to encourage and foster the erection of independent plants at every point in our land where service can be rendered. If you do not have the financial strength to give your neighbor service, then encourage him in striving to establish such service; give him the benefit of your advice and co-operation; help him to so build his lines that they will answer for the future as well as for the present. Too many of our independent telephone lines are built of cheap material with common returns, inferior switchboards and poor equipment. While this has often been the case in the past, it should never be the case hereafter. Let every plant be built in the most substantial manner, and of the best material. While the first cost will be greater, the efficiency will also be so much greater and our patrons will be so much better satisfied. Then it is a duty we owe to each other to build all our plants so that when toll lines that are now marching over the mountains and creeping over the vales are ready to connect with us efficient service will be rendered. I know there is quite a temptation to use cheaper material, when at the same time we can give fair local service. When iron can be bought for nearly one-fourth the price of copper, we are tempted to use iron, but sooner or later you will be sure to regret it. The very best is none too good. Anothe



<sup>\*</sup>Paper read at the Fourth Annual Convention of the Independent Telephone & sociation of the United States at Cleveland, O., June 12-14, 1900.

duty we owe to each other is not to infringe on each other's territory. Let each local company have the territory that properly belongs to them, and must not attempt to parallel their lines. If you do, it will in the end prove a useless waste of money, and I am sure with a little effort you can harmonize your difficulties and reach a result satisfactory to all interested. We must bear and forbear in the telephone world the same as in other business matters if we wish to succeed, and we must always remember that we have a strongly entrenched opponent to fight, and we cannot afford to carry on a guerrilla warfare among ourselves or fritter away our strength on little difficulties that can easily be harmonized. If you disagree with your neighbor, agree to refer the dispute to a competent referee, say the advisory board of the National Association, and agree to abide by their decision in the matter. Be neighborly, advise with each other, help each other in every manner possible. By so doing you will secure the greatest amount of efficiency at the least possible cost, and each of you will benefit by the experience of the other.

Another great duty we owe to ourselves is to give our patrons in the independent field long distance service at the earliest possible moment. Already giant strides have been made in this direction, and if we work in harmony soon the entire United States will be covered with toll lines such as the wildest telephone enthusiast has never dreamed of. Telephones are no longer a luxury, but are now an absolute necessity, and the business world can no longer do without them, and we, who would be the most successful purveyors of the public requirements along these lines, will be the most successful in advancing not only our own individual and financial interests, but the interests of the independent telephone companies throughout the United States and the world. The aggregated value of the independent plants in the United States already makes an immense showing, but it is nothing to what will be shown in the future under proper management. And along these lines the independent companies owe a duty to each other. Don't start too many long distance companies. No good can possibly come of any such attempt. It is far better to harmonize your interests, and let either one or two companies, I really think one is sufficient; and I would advise you to pool your interests in one company, and toll line a State or even two contiguous States. A toll system under one competent head will prove more satisfactory, and will be far better managed than half a dozen systems under as many different heads. Under the latter arrangements there are bound to be misunderstandings, clashes of authority, inefficient service and dissatisfaction. An old adage says that "Too many cooks spoil the broth." The State of Ohio and some of the other Western States have already shown us how efficient this service can be made if properly handled. Let the States that have not as yet built long distance lines profit by their example and follow in their footsteps. It may sometimes happen in a State that three or four long distance companies take out charters, get contracts with local companies, all with the same intention of giving long distance service. When such is the case, my advice to you all is to get together, turn all the grist into one mill, and be sure to select the mill that has the greatest and best grinding capacity.

It takes money to build toll lines. You can-

not do it on wind or paper contracts; and after all, what every independent company wants now that they have first-class local service, is long distance connections, the very best obtainable, and they want it as soon as possible; and the means that will reach this result are the best means for all of us, and should receive our united support. If we can for a while brush away the crumbs of selfishness that are gathering in our pathway, and remember there are others with equal claims to ours, we will soon be in proper mental condition to bring about the harmonious results, and the sooner we will be able to bring about first-class local and long distance service. The opportunity is ours if we but decide to approach the question in a spirit of fairness. Let us pool our issues, wipe out our disagreements, stand heart to heart, shoulder to shoulder in an onward and upward march to telephonic perfection. Let the spirit of our sires fully imbue us with that old truth, "United we stand, divided we fall."

### OPERATING ECONOMIES IN CENTRAL STATION PRACTICE.\*

BY W. L. ABBOTT.

In every central station there grow up characteristic systems of practices, good, bad or indifferent, due partially to peculiar environments and partially to the ability of the operating force. Through natural selection the best of these practices are gradually crystallized and become the unwritten code of rules for the direction of the internal affairs of the station. Some of these practices, while the very best for that station in which they originate, may prove very unsatisfactory when transplanted into other stations; yet it is largely due to the cordiality with which central station managers impart to and adopt on trial from each other new methods that the present rapid improvements in operating details are being made.

The saving with renovating of waste and oil is an ever present and variously handled question in all stations. Some simply use the waste until it is oil soaked and then burn it under the boilers; others go to the other extreme and use wiping towels, which are carefully saved, washed and used over again. We favor a middle course, using a good quality of waste, first on the finer parts of the machinery and then for coarser work, after which it is put through a washer consisting of a train of rolls, over which hot water is running. This extracts nearly all of the oil and much of the dirt.

The oil and water are caught in a receptacle, the oil separated and passed to the oil purifier and the waste is put into the drier. This drier consists of a sheet iron box 30 inches square and 6 feet high, filled with shelves, one above another, made of wire netting and spaced about ten inches apart, for the reception of waste to be dried. The case stands a few inches from the floor, and in the bottom, which is open, is a steam coil. A door occupies one full side, and to the top is connected an 8-inch galvanized pipe leading to the boiler breeching for the purpose of inducing a draft. whole thing is quite simple and inexpensive, yet it will thoroughly dry a charge of 200 pounds of damp waste in a few hours. This dry waste is somewhat harsh and knotty, but

has better absorbing qualities than new waste, and we use and wash it over and over again.

The oilers are allowed but ‡ pound of new waste on a shift to keep a 1,200 horse power engine clean, but they are allowed all of the washed waste they want. In separating oil from waste it is difficult to say which is the by-product and which the direct product, as from 100 pounds of oily waste we get 40 pounds each of oil and waste, and one product is about as valuable as the other.

The amount of engine oil used at our Harrison street station has been reduced to the lowest possible minimum I think, as it amounts to only about 50 gallons of new oil each month. This is obtained by catching and refining all the lubricating oil used on our machinery, which is quite readily possible on vertical engines. The drains from our crank pits are carried down into the oil refiners, and the oil from the waste is all saved and put through a process which makes it better than new oil. This may sound like an exaggerated statement, but I will explain later on why it is better than new oil. I have spoken of oil retiners and of refining the oil, instead of filters and filtering the oil, for the reason that we have no filters and do no filtering, but purify the oil by settling and boiling. Our refiners consist essentially, of three upright cylindrical tanks, the first of which receives the oil from the engines mixed with cylinder drips and water from journals, etc. In this tank, which is half full of water and half full of oil, the water and oil separate. The water goes to the bottom, where it is drawn off through a trap. The oil goes to the top and is drawn off through an overflow leading to the bottom of the second tank, in which is a steam coil under a pressure of about 100 pounds. This is for the purpose of heating the oil up to about 250°, at which temperature the water is driven off in the form of steam.

Owing to the surface tension of the oil around the small globules of water held in suspension, the water will not vaporize at a lower temperature. This tank is of such a capacity that the oil is about two days in passing through it, and it then goes to the bottom of the third tank, where it is allowed to stand about the same length of time and where any sediment it may contain will be deposited. From the top of the third tank the oil overflows into a large storage tank, where it is kept until drawn off to be used. Few of those who have not looked into the matter would realize how much water will be absorbed and held in suspension by oil which contains a small trace of animal matter and how difficult it is to break up the combination once it is formed. Those of you who operate oil filters may have sometimes wondered at the accumulation of grease in them, this grease being a soft, jelly-like substance of the consistency of warm lard, or perhaps even thicker. This grease is no more than a combination of mineral oil, a small trace of animal oil and about 40 % water. If it were placed in a vessel and heated to about 250°, the water would be driven off (perhaps with explosive force if heated too rapidly, but if the work is carefully done the water can be separated), and what is left would be the best kind of lubricating oil, containing a small trace of animal oil and in our case, all the cylinder oil from which the animal oil is derived. It is the mixture of the cylinder oil with the engine oil which gives it. its heavier body and better lubricating qualities. The oil which is expressed or washed out from the waste apparently contains more



<sup>\*</sup>Abstract of paper read at the National Electric Light Association Convention, Chicago, Ill., May 23, 1900.

cylinder oil than that which comes from the engine drains, and on this account those who throw away their waste, not only lose the waste, but the richest part of the oil which is contained in it. That this amount is considerable will be seen from the fact that from every 100 pounds of oily waste we get about 40 pounds of clean waste and 40 pounds of oil.

The question of cylinder lubrication was once a very perplexing one for us, but after studying and experimenting we settled the question in such a way that it has not been open for several years. We had great trouble with cylinder oil, and had difficulty in finding an oil which would lubricate all of the cylinders of our triple-expansion engines from one lubricator. We have not found such an oil and do not expect to. We could find an oil which would lubricate the high pressure cylinder, and we could find an oil that would lubricate the low pressure, but we could not find  $\boldsymbol{a}$ combination which would lubricate all of the cylinders perfectly. We have therefore, adopted an oil which will lubricate the high pressure cylinder excellently and the intermediate cylinder moderately well, while the low pressure shows only a slight trace of oil. As there is no cutting or scratching in the low pressure while it runs dry, and as the high pressure cylinder makes a prompt and vigorous protest if allowed to run dry for a few moments only. we have adopted the oil which will give the best results in the high and let the low be content with what it gets.

The results of our experiments have convinced us that the only oil to use in a nonjacketed cylinder, where it would come in contact with very wet steam, is one which is very highly compounded. It must also be an oil of a high fire test, and the reason why it does not lubricate the low pressure cylinder as well as the high is that the temperature of the steam in the low pressure cylinder is so low that the oil will not remain atomized in the steam, but washes down and combines with the water of condensation which has formed in the other two cylinders, and passes through the low pressure cylinder in an emulsion with the To prove this theory I have tried the water. plan of mixing a cylinder oil of a high grade and high flash test with a light oil of low flash test, and feeding it through one lubricator through all three of the cylinders. The result shows a fair trace of oil on the walls of the low pressure cylinder, and we ran our engine with this kind of cylinder lubrication for several months, but finally decided that the best results for the entire engine were obtained with the oil which gave the best lubrication in the first cylinder. We now use a heavily compounded high fire-test oil fed into the steampipe near the throttle. A gallon of oil so fed will give good lubrication for a 1,200 horse power engine for 12 hours. I have seen a compound engine of this capacity fed at the rate of nearly a gallon an hour without obtaining satisfactory lubrication, the whole trouble lying in the fact that the oil was not adapted to the particular conditions under which the engine was working, and I think this may account for the unmeasured praise or unstinted abuse which different brands of good oil receive from different engineers, and I think, furthermore, that the difference between a good oil and a poor oil made from high fire test stock lies almost wholly in the amount and kind of compounding.

In arranging an operating force and the payroll of the central station the superintend.

ent should aim to get the maximum of results with the least expenditure of money and still to keep everything harmonious. To do this he should carefully arrange his force so that he will at all times have men enough to take care of the amount of work on hand, and at no time have a surplus of help over what is required to take care of the work to be done. His scale of wages should also be carefully graded, so that the men doing the same class of work should receive the same pay, and that the rate of pay to the different classes of workmen should be in proportion to the skill, responsibility or manual labor required. Further than this, a considerable saving in money can be made by paying the men partially in hopes and promises. By this I mean to have a welldefined line of promotion, each man knowing his position in that line, and that his chances for promotion depend upon his ability, fidelity and length of time in the service. Any really good, ambitious young man is ready to begin work at the bottom of the ladder, and will work contentedly along on small wages if he is assured that the promotions to come will be awarded upon the above terms and not by favoritism. The most demoralizing and disorganizing practice that can be introduced into a central station is to put a new man, the relative of some official, or the friend of some politician, into a desirable position over the heads of equally good men who have borne the drudgery and hard work of inferior positions, hoping and expecting that when there was a vacancy in a better position they would have the preference.

In many stations the force is divided into a night gang and a day gang, but I never thought this well adapted to central station work. The hours are too long, and it does not give the best distribution of labor, the number of men in the station not varying according to the load. The practice which we instituted several years ago of bringing the men on one or more at a time an hour or so apart and letting them off in the same way can be made to exactly meet the requirements of an uneven load, and enables us to rotate the different men of the same class through all the different shifts during the course of one or two months, thus making the work and the hours of all exactly alike in the cycle. At the end of each week the schedule is made up for the week to come for each of the different classes of operatives interested, and this is posted on Saturday night, so that as the men go off work on the following Sunday it is known what shift each will have during the coming week. These schedules are altered from week to week, increased or diminished as regards the number of men and changed in form to conform to the varying conditions of the load curve.

To illustrate by a set of December schedules: The problem to be solved is to arrange the schedule so that there will be at any time enough men for the work without having too many men around at other times, and furthermore, to arrange the shifts so that none will be obliged to go home between the hours of 1 and 6 A.M. As we are not sure what the load will be from day to day, or a week ahead, we are obliged to provide men enough to take care of what we assume will be the reasonable maximum. With a little care and study, it is possible to arrange the schedule to very nearly meet the exact requirements. Take, for example, the firemen's schedule for the week commencing December 18, 1899. We start at midnight with five firemen; two of these are relieved at

1 A.M., by two other men, who come on at that time. As the load from midnight to 6 A.M. is quite irregular, owing to the variable amount of charge required by the battery from day to day, we have rather more firemen on during this period for the amount of work done than we have during other times of the day. At 6 A.M. the load begins to pick up, and has nearly reached its morning maximum by 9 A.M. To take care of this our force of firemen is increased by one man each at 6, 7 and 8 o'clock, there being by that time eight men on, and the force is held at that number until 1 P.M. During this time several men come on and others leave, but the number at work remains the same. The slight drop of the load at noon is not followed by a corresponding change in the number of men, but it is taken advantage of as a slight breathing spell and gives the men an opportunity to clean fires and eat their dinners. After the mid-day drop in the load there follows a gradual rise until 4 P.M., which we anticipate by bringing a man on at 1 and another at 2 P.M. At 4 P.M. the load rises abruptly to the maximum shortly before 5 P.M. We provide for this by bringing three men out at 3 P.M., to get their fires in good shape, ready for this hard pull, and, finally, at 4 P.M. the last man comes, which brings the total number of firemen on at this time of the day up to 14 men. After 5 P.M., the load gradually declines, until at midnight it is only about one-fourth as high. Owing to the way in which the men have been brought out their shifts are finished so that the force is automatically decreased in proportion as the load decreases, and we have during the day worked 21 firemen, who have altogether burned about 200 tons of coal, and have been so distributed that we have at all times had an excess of one or more men for the work, and none have been overworked.

The greatest possibilities for saving or wasting about a steam plant are undoubtedly in the coal pile, but the subject does not receive the consideration to which it is entitled. average ambitious englne man will spend much time and care on his engine to be sure that the indicator cards are perfectly symmetrical, that the points of cut-off are equal, that the release is in time, and that the compression rises to meet the admission in a smooth, rounded curve. This is proper and commendable; yet the same time spent in studying the conditions of combustion in his furnace might show him a way to make a saving in fuel fourfold greater than is possible in the final refinements of the indicator cards. A fireman whose wages amount to, say 20 cents an hour, will burn during that time fuel costing 10 and 15 times as much as his wages. It would not be possible by any sort of driving to save half of the wages, but it is readily possible, by properly watching and instructing the firemen to save double his wages in coal. In the first place, great care should be exercised in the selection of the coal to be used. I believe that the cheapest coal is that kind which has the greatest amount of combustible for the least amount of money, provided the furnaces are of the proper kind and ample in capacity to make the required amout of steam from them. The very cheapest kind of Illinois screenings, costing less than \$1.50 a ton, will not have less than 10,000 British thermal units a pound, and the very best of Eastern lump, costing \$4 a ton will not have more than 14,000 British thermal units a pound. This means, then, that for equivalent heating qualities the cheapest



screenings cost about half as much as the high grade coal.

Having selected the coal, the next problem is how to burn it properly. It is commonly understood that 12 pounds of air are needed to properly burn 1 pound of coal. It is also commonly supposed that in practice about twice this amount of air passes through the fire, but just how much actually passes, and under what conditions are the best results obtained are impossible to determine without making analyses of the flue gases. Fortunately, this has now become a very simple operation, and one which can be performed and understood by anyone competent to take charge of a large boiler room. These tests often show the most surprising and disappointing results. The analyses are made to determine the percentage of carbon dioxide in the flue gases. Under perfect conditions it can run as high as 20 per cent., but it is not unusual to find samples running as low as 2 per cent. of dioxide. This brings down the economy for two reasons: (1), the gas in the firebox is diluted with an excess of cold air and cooled down, and (2), the amount of gas being increased in volume passes the boiler more rapidly and does not give up so much of its heat. It is almost a paradox that within reasonable limits the more the gases are cooled down in the furnace by the admission of excess of air the botter they will pass away from the boiler. The two causes of excess of air in the flue gases are running boilers on too light loads and careless firing.

In a station where the load is much higher for a few hours than during the rest of the day the tendency is to have too many boilers in service during the period of light load. The natural result is that the fires are run thin, the grates get bare in places, a great volume of air is drawn in and only a small portion of it comes in contact with the fuel. Careless firing is always a flagrant waste of fuel. An engine man may be aware that he is not getting the results which his tests lead him to believe he should have, and yet in a boiler room where several men are working it is exceedingly difficult to fasten the blame on any one of them unless one tests the flue gases.

To follow intelligently the work of the individual fireman we have installed in our boiler room a device called the econometer, through which is induced a small current of gas from a boiler breeching. The weight of this gas changing with its composition, moves a pointer across a dial; thereby indicating continuously the varying percentage of carbon dioxide in the flue gas. From this device are run individual pipes to the breeching of each boiler, and all is so arranged that samples may be drawn from several boilers and tested in a few minutes, or a continuous test may be made of the performance of any one boiler. Readings taken from this instrument at regular and short intervals, when plotted, form a curve which is a very comprehensive record of the conditions of combustion during the time of observation.

#### Wireless Telegraphy with Balloons

Messrs. J. Vallot and J. and L. Lecarme have contributed to the "Moniteur Industriel" a note on their experiences with wireless telegraphy in a balloon. They state, says the "Electrical Engineer," London, that the object of the experiments was to discover whether it was possible to communicate by Hertzian waves between the earth and a free balloon at a great distance, and without a conductor connecting the receiver to the earth. The trans

mission post was at Landy, and was composed of a battery of 10 accumulators, a key, an interrupter, and a coil and oscillator. One of the poles of the coil was connected with the earth, and the other with a receiving apparatus composed of an insulated copper wire suspended from a small captive balloon. The receiver was placed in the balloon, which rose at first vertically. The signals were heard very distinctly in the balloon at an altitude of about 600 yards, the horizontal distance being about three miles. They were still noticeable at an altitude of 900 yards and a distance of nearly four miles, but it was necessary to increase the sensibility of the apparatus. Owing to the direction of the wind, the gasometers at Landy were after a time interposed between the receiving wire and balloon, and the experiments were discontinued after 10 hours, at which time the signals could not be distinguished. The authors conclude that a wire to earth is not indispensable for transmission to a long distance, and that when the balloon at first rises vertically to a great height the signals could be clearly heard, although the two antenna were a prolongation of each other, and that the normal planes of their extremities were parallel and separated by a great distance. In concordance with the results obtained at Mont Blanc, the difference n potential between the two posts did not seem to affect the working of the apparatus.

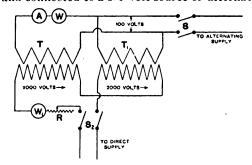
#### CURRENT-RUSHES INTO TRANSFORM-ERS.\*

#### BY R. C. CLINKER.

It is a well-known fact that at the instant of switching a transformer or a group of transformers on to a live circuit, a momentary rush of current often takes place through the primary winding. This manifests itself usually by a kick of the ammeter, if one happens to be in circuit, or by a loud hum which dies away to the normal sound within the first few seconds. The explanation of the effect is probably this: The magnetic condition of the iron before the transformer is switched on demands upon that point in the cycle at which the switch was last opened. The magnetic circuit being a closed one the iron has no poles which tend to demagnetize, hence the induction in the core may have a maximum, zero, or intermediate value, depending upon the instantaneous value of the magnetizing current when the voltage was removed from its terminals. If now voltage be suddenly reapplied to the primary in such a direction that to produce the necessary back E.M.F. a change of induction is required in the direction in which the iron is already highly magnetized, the permeability of the iron is so low in this direction that a large rush of current is necessary to produce the required change of flux. During the next few seconds the magnetic cycle in the iron does not take place around the zero point. Indeed, the direction of magnetization may not even reverse in sign during the first few cycles. The tendency which exists in the iron, however, towards zero magnetization asserts itself, and the magnetic cycle slowly descends from higher values of induction until it takes place around the zero point. One or two interesting experiments which the author made on this point some months ago make this action more apparent. In one a direct current ammeter with well-damped needle (such as a Weston instru-

ment) is included in the circuit when switching on. If this ammeter be of fairly small range, a direct current will be seen to p: ss through the transformer for a considerable time after the circuit is closed. Thus, in the author's test, a 10 kw. transformer was experimented upon, a 5 ampere Weston ammeter being placed in circuit with the 100 volt terminals, which could be switched on to a 100 cycle supply. The normal alternating no-load current was about 1.5 amperes, but a kick of fully 5 amperes could often be obtained upon the Weston ammeter, the direction being of course either positive or negative. After the first kick the needle slowly sank to zero, but in some cases a small direct current flowed through the transformer for fully one minute ofter the closing of the switch. It is evident that this direct current means a continuous change of the total induction linked with the circuit, going on quite independently of the cycle or range of induction-value necessary to supply the back E.M.F.

The effect may be produced more artificially by magnetizing the core in one direction with a direct current, while the alternating voltage is still applied to the terminals. To neutralize the induced voltage in the magnetizing coil, the author used two transformers connected as in the diagram. T and T<sub>1</sub> were two 50 kw. transformers, both of 20:1 ratio. Their low pressure windings were paralleled and connected to a 100 volt source of alternat-



ing supply, two ammeters, one an alternatingcurrent instrument (A) and the other a direct current Weston (W) being included in the circuit. The high pressure windings were connected so that their E.M.F.'s opposed, and a direct-current circuit with resistance and ammeter  $(W_1)$  was introduced in series with them. A direct current could thus be made to flow in both primaries quite independently of any induced voltage.

On closing switch  $S_1$  the ammeter  $\Lambda$  read, of course, the no-load current of T., while no permanent deflection was produced on W, the pointer merely vibrating over the zero. As A was a 60-ampere instrument, this small current produced very little deflection. On closing S2 and allowing current to flow through the highpressure coils, a momentary direct current was, of course, indicated by W, while the no-load current read on A was increased, owing to the lower average permeability of the iron at the higher inductions through which the magnetic cycle was taking place. By reducing R sufficiently, this no-load current could be increased to 60 amperes, the scale limit of ammeter  $\Lambda$ . The interesting point of experiment, however, lay in the effect of suddenly opening switch S<sub>s</sub>. The magnetic cycle, having no resultant magnetizing force left to support it at so high an induction, gradually descended to its normal position, occupying in its descent an interval of at least one minute. For that space of time a direct current could be observed flowing through W. The immediate effect of opening

<sup>•</sup> From the "Electrician," London.

 $S_a$  upon the reading of  $\Lambda$  was to reduce it about one-third, from which value it slowly crept down to the normal magnetizing current. One effect of working at this high induction was to cause the transformers to hum loudly.

The method of connection used in this experiment may also be used to show that the hysteresis loss in the cores is dependent only upon the total range through which the induction passes, and not upon the actual value of that induction, a wattmeter being placed in circuit to measure this in the usual way.

#### LEGAL NOTES.

In the United States District Court of Boston, Mass., a short time ago, Judge Colt gave a hearing in the case of the Thomson-Houston Electric Company and the General Electric Automobile Company against the Exeter, Hampton & Amesbury Street Railway Company, which is a proceeding growing out of the alleged infringement of the complainants' patent, No. 393,323, relating to certain improvements in switches for electric motors. The case came up on a motion for a preliminary injunction to restrain the defendant from making, using or vending or causing to be made, used or sold any apparatus embodying the improvement or invention in question.

On June 29 Justice Scott in the New York Supreme Court set aside a verdict obtained by Paul Hertzog against the Municipal Electric Light Company of Brooklyn for alleged negligence in wiring his furniture store, on Broadway, improperly. The lights were put in in 1892 and a short time afterward the store was burned down. He alleges that defective insulation was the cause of the fire. Justice Scott says the evidence did not prove that the defendant company was unskillful in stringing its wires.

#### Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended June 30:

Antwerp, 16 packages, \$1,875; Argentine Republic, 370 packages, \$20,197; Australia, 1 package, \$30; Bahia, 1 package, \$100; Berlin, 1 package, \$15; British Guiana, 1 case, \$7; British East Indies, 81 packages, \$2,490; 20 cases, \$4,-259; British Possessions in Africa, 2 cases automobiles, \$850; 20 packages, \$562; British West Indies, 10 packages, \$144; Brindisi, 10 cases, \$2,150; Brazil, 269 packages, \$8,327; Cairo, 6 packages, \$105, Central America, 102 pounds, \$4,728; Chili, 5 cases, \$161; Cuba, 60 packages, \$1,588; Ecuador, 67 boxes, \$396; Florence, 1 case, \$22; Genoa, 40 cases, \$2,664; Glasgow, 95 automobiles, \$40,000; 16 cases, \$859; Gothenburg, 6 cases, \$230; Hamburg, 45 packages \$4,088; 20 cases, \$5,300; 2 boxes, \$30; Havre, 32 boxes \$5,490: 9 automobiles, \$4,330: 9 boxes, \$650; Hull, 2 cases, \$250; Liecester, 1 case, \$3; Liverpool, 88 packages \$3,754; 4 cases \$40; London, 137 packages, \$9,118; 63 electrical cable reels, \$15,301; 13 cases, \$112; 4 cases automobiles, \$1,700; Manchester, 4 cases, \$650; Mexico, 123 cases, \$2,673; Milan, 1 case, \$5; 5 packages, \$168; Moscow, 4 cases, \$57; Naples, 47 packages, \$10,935; New Foundland, 36 cases, \$1,143. Nova Scotia, 4 cases, \$118: Peru, 9 cases, \$386; Porto Rico, 112 packages, \$11,565; Rome, 1 case, \$8; 3 packages, \$155; Rotterdam, 2 cases, \$18; Santo Domingo, 2 cases, \$20; Southampton, 100 packages, \$3,546; U.S. Colombia, 119 packages, \$2,263; Vienna, 7 cases, \$181.

#### INCORPORATIONS.

The Blair County Light, Heat & Power Company, Altoona, Pa. Capital stock, \$50,000.

The City Light Company, Peru, Ind.-to operate an electric light plant. Capital stock, \$25,000. Incorporators: S. V. Perrott, H. C. Uhlen and A. G. Perrott. all of Peru.

The Colorado City Electric Light & Power Company, Colorado City, Col.-to furnish electric light. Capital stock, \$10,000. Incorporators: C. M. Sherman, C. L. Cunningham C. E. Corcoran, M. Drake and J. R. Watt, all of Colorado City,

The Cementon Electric Light & Power Company, Cementon, Pa. Capital stock, \$10,000. Incorporators: J. S. Wentz of Mauch Chunk; G. D. M. Creary, W. B. Whitney. both of Philadelphia; A. C. Leiseming, of Upper Lehigh, and T. M. Righter, of Mt. Carmel.

The Neversink Light & Power Company, Middletown, N.Y. to manufacture electricity and gas. Capital stock, \$100,000. Directors: Philip A Rorty, William J. Burk and N. C. Mc-Brair, all of Middletown.

The Galaxy Car Company, Poughkeepsie, N. Y.-to manufacture and lease passenger and freight cars used on electric railroads. Capital stock, \$5,000. Directors: E. C. M, Rand, New York City; James L. Williams and Frank Hasbrouck, Poughkeepsie.

The Dutchess Light, Heat & Power Company, Rhinebeck, N. Y.-to manufacture electricity. Capital stock, \$20,000. Directors: George N. Miller, Thaddeus A. Traver and Frank Herrick, all of Rhinebeck.

The Lebanon City Electric Light, Heat & Power Company. Lebanon, Pa.—to supply light, heat and power. Capital stock, \$25,000. Incorporators: D. D. Coleman, E. K. Coleman, A. Brock, H. Brock, all of North Lebanon Township, and J. P. S. Gobin, of Lebanon.

#### ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS. at 302 and 304 Broadway (Room 1204), New York City, also at 659 F street, N.W., Washington, D.C., who has been identified with this work before the U.S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon pay ment of ten cents. When ordering give name, date and title of invention wanted.]

#### LETTERS PATENT ISSUED JUNE 26, 1900.

#### ELECTRIC RAILWAYS AND APPLIANCES.

ELECTRIC RATEWAYS AND APPLIANCES.
652,266. Electromagnetic Brake. Edwin M. Herr, Pittsburg, Pa., assignor to the Westinghouse Air Brake Company, same place. Filed Nov. 18, 1899.
652,48. Electric Railway System. Lowell M. Maxham, Boston, Mass., assignor, by mesue assignments, to the Bay State Traction Company of West Virginia. Filed Sept. 20, 1809.
652,364. Subterranean Current Distribution for Electric Street-Cars. Eduard von Mairhofen, Wurzburg, Germany. Filed March 9, 1900.
652,676. Aerial Switch for Electric Railways. Otto Joedicke, Muhlhausen, Germany. Filed Dec. 11, 1899.

#### ELECTRIC LIGHTS AND APPLIANCES.

652,255. Cluster-Fixture for Incandescent Lamps. James F. Faries, Decatur. Ill. Filed Oct. 21, 1899.
652,374. Incandescent Lamp for Electric Lights. John F. Sanders, Chicago, Ill. assignor to Harry Brown, same place. Filed Oct. 12, 1899.
652,494. Electric-Lighting Apparatus. Charles A. Terry, New York City. Filed July 14, 1898. Renewed Dec. 16, 1899.

New York City. Filed July 14, 1898. Renewed Dec. 16, 1899.
652,580. Electric Lamp. Serge B. Apostoloff, London, Eng. assignor to the Spiral Globe, Limited, same place. Filed Oct. 10, 1899.
652,697-652,610. Electric-Lighting Apparatus. Marshall W. Hanks, Pittsburg, Pa., assignor to George Westinghouse, same place. Filed March 24, 1899; renewed Jan. 9, 1900; filed May 2, 1899. renewed April 16, 1900.
652,609. Multiple Glower Lamp. Marshall W. Hanks, Pittsburg, Pa., assignor to George Westinghouse, same place. Filed April 21, 1899. Renewed March 27, 1900.
652,609. Glower-Terminal for Electric Incandescent Lamps. Marshall W. Hanks. Pittsburg, Pa., assignor to George Westinghouse, same place. Filed April 22, 1899. Renewed April 28, 1900.
652,630. Heater Cut-Out Device for Electric Lamps. Walther Nernst and Henry N. Potter, Gottingen, Germany, assignors to George Westinghouse, Pittsburg, Pa. Filed Sept. 12, 1899. Sept. 12, 1899. 652,634. Anti-Automatic Heater-Operating Device for Lamp-Cir-

ts. Henry N. Potter, Gottingen. Germany, assignor George Westinghouse, Pittsburg, Pa. Filed Aug. 9, 1899.

Electric Heater and Supporting Material Therefor.

Menry N. Potter, Gottingen, Germany, assignor to George Westinghouse, Pittsburg, Pa. Filed Aug. 9, 1899, 1891, Controlling System for Electric-Lamp Heaters, Henry N. Potter, Gottingen, Germany, assignor to George Westinghouse, Pittsburg, Pa. Filed Aug. 14, 1899.

652,638. Heater for Electric Glower-Lamps. Henry N. Potter, Gottingen, Germany, assignor to George Westinghouse, Pittsburg, Pa. Filed Sept. 8, 1899.
N. lotter, Gottingen, Germany, assignor to George Westinghouse, Pittsburg, Pa. Filed Sept. 11, 1899.
Kestinghouse, Pittsburg, Pa. Filed Sept. 11, 1899.
Septinghouse, Pittsburg, Pa. Filed Sept. 11, 1899.
Septinghouse, Pittsburg, Pa. Filed Sept. 11, 1899.
Septinghouse, Pittsburg, Pa. Seignor to George Westinghouse, same place.
Filed April 21, 1899. Renewed Jan. 17, 1900.
Septinghouse, Same place, Filed June 9, 1899. Renewed Jan. 44, 1900.
Septinghouse, same place. Filed June 9, 1899. Renewed Jan. 41, 1900.
Septinghouse, same place. Filed June 9, 1899. Renewed Feb. 14, 1900.
Septinghouse, same place. Filed June 9, 1899. Renewed Feb. 14, 1900.
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#### ELECTRICAL MACHINERY AND APPARATUS.

652,360. Motor Rheostat John L. Hall, Schenectady, N. Y., assignor to the General Electric Company of New York.

652,360. Motor-Rheostat John L. Hall, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed May 10, 1940
652,390. Electric Governor. William W. Handy, Baltimore, Md. Filed March 9, 1899.
652,453.652,454. Alternating-Current Electric Meter. Emile Batault. Geneva, Switzerland. Filed Aug. 2, 1898.
652,596. Switch for Electric Circuits. Ethan I. Dodds, Avalon, Pa., assignor to George Westinghouse, Pittsburg, Pa. Filed Sept. 9, 1899. Westinghouse, Pittsburg, Pa., Filed Sept. 9, 1899. Renewed May 14, 1900.
652,598. Snap Switch for Electric-Lamp Circuits. Ethan I. Dodds, Avalon, Pa., assignor to George Westinghouse, Pittsburg, Pa. Filed Sept. 9, 1899. Renewed May 29, 1900.

1900.
(52,599. Automatic Push-Putton Switch for Electric Lamps. Ethan I. Dodds. Avalon, Pa., assignor to George Westinghouse. Pittsburg. Pa. Filed Sept. 9, 1899.
(52,600. Knife Switch for Electric-Lamp Circuits. Ethan I. Dodds. Avalon, Pa., assignor to George Westinghouse, Pittsburg. Pa. Filed Sept. 9, 1899.
(52,601. Cut-Out for Electric-Lamp Circuits. Ethan I. Dodds. Avalon, Pa., assignor to George Westinghouse, Pittsburg. Pa. Filed Sept. 9, 1899.

#### TELEPHONES AND TELEPHONE APPARATUS.

TELEPHONES AND TELEPHONE APPARATUS.
652.772. Telephone Toll System. John A. Johnson, Waveland, Ind Filed May I, 1899.
652, 432. Telephone System. Cornelius C. Gould, Philadelphia. Pa., assignor by direct and mesne ass gnments, to the Gould Telephone Company, Wilmington, Del. Filed Feb. 12, 1900.
652, 459. Electric Circuit. Cornelius C. Gould, Philadelphia, Pa., assignor, by direct and mesne assignments, to the Gould Telephone Company, Wilmington, Del. Filed Jan 21, 1849. Renewed Feb. 23, 1900.
652, 507. Pad-Holder for Telephones. Cornelius A. Bovee, Adrian, Mich. Filed Nov. 16, 1899.
652, 508. Microphone-Transmitter. Clayton B. Clark and Charles B. Clark, Sing Sing, N. Y. Filed July 25, 1899.

### MISCELLANEOUS.

Elevator. Walter C. Stokes, New York City. Filed

MISCELLANEOUS.

652,301. Elevator. Walter C. Stokes, New York City. Filed Feb. 21, 1900.
652,302 Device for Electrically Operating Bulkhead-Doors. Albert H. Thomas, Philadelphis, Pa., and Franklin B. Richmond. Camden, N. J. Filed May 10, 1899. Renewed Dec. 18, 1899.
652,399. Battery Compound. Henry Blumenberg, Jr., New York City. Filed Oct. 10, 1899.
652,383. Electric Signal. John H. Sanor, Canton, Ohio. Filed Oct. 19, 1899.
652,385. Secondary Battery. Clyde J. Coleman. Chicago. 111., assignor to Thomas J. Ryan New York City. Filed Aug. 3, 1890.
650,430. Electric Hand-Lighting Gas-Burner. George J. Galbraith, Boston. Mass., assignor to the Electric Gas Lighting Company, same place. Filed Aug. 24, 1899.
652,436.652,437. Thermo-Electric Battery or Pile. Joseph Matthias. Stuttgart, Germany. Filed June 19, 1899.
652,446. Electromedical Bath Johann. J. Stranger, Ulm., Germany. Filed April 20, 1800.
652,457. Phonograph. Thomas A. Edison, Llewellyn Park, N. J. Filed Sept. 21, 1899.
652,504. Electric Heater. Edward Bennett, Jeanette, Pa., assignor to George Westinghouse, Pittsburg, Pa. Filed Dec. 7, 1899.
652,505. Telegraphic Transmitting Apparatus. Frederick G. Creed, Glasgow, Scotland. Filed Nov. 7, 1898.
652,611. 'ombined Diap' rigm and Electrode. James Hargreaves. Farnworth-in-Widnes, Eng., assignor to the General Electrolytic Parent Company. Limited, same place Filed Feb. 12, 1898.
652,640. Electric Furnace. Henry N. Potter, Gottingen, Germany, assignor to George Westinghouse, Pittsburg, Pa. Filed Sept. 15, 1899.
652,707. Phonograph. Frederick W. Baynes, London, Eng. Filed Feb. 18, 1899.
652,734. Alarm System Clyde Coleman, Chicago, Ill., assignor, by direct and messie assignments, to the Bankers Electric Protective Company. Filed Oct. 18, 1899.

#### REISSUES.

11,835. Bond for Rails. Ge rge A Weber. Stamford, Cons. Filed Feb. 12, 1900. Original No. 608,786, dated Aug. 9,

11,898,
11,898.
11,899.
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11,899.
11,899.
Electric Company. Pittsburg, Pa., and John D. Gibbs,
London. Eng., for the Westinghouse Electric Company,
assignee, by mesne assignments, of Lucien Gantard. deceased, and John D. Gibbs, assignor to the Westingh deElectric and Manufacturing Company, Pittsburg, ra.
Filed Aug. 6, 1889. Original No. 351,589, dated Oct. 26, 1886.



### THE TELEPHONE WORLD.

#### Bell Company Out-Manœuvred.

In the telephone world each new move against the Bell monopoly is watched with eager interest, and success or failure is attended with alarm or pleasure, according to the standpoint of the observer's interest, says the N.Y."Commercial." The opposition to the Bell Company gathers strength as it moves, and has now assumed proportions of consequence.

Its impetus has been increased by the knowledge that the Bell Company has been caught napping on several occasions. It now finds important positions slipping from its grasp.

The opposition has been working very quietly but persever ingly, and three of the most important sub-companies of the Bell Company have passed under other control. The largest of these is the Erie, a majority of the stock of which is now held by the Knickerbocker Telephone Company of New York.

The identity of the other two has not yet been made known owing to the secrecy with which the various moves in the game have been surrounded.

It is understood that the Telephone, Telegraph & Cable Company of America is behind the Knickerbocker in its undertaking to wrest control of the Eastern field from Bell interests. In fact, it is expected that final success in this direction will be followed by the revelation that the Knickerbocker Company and the Telephone, Telegraph & Cable Company are very nearly identical.

The point is that the Knickerbocker Company can accom-

The point is that the Knickerbocker Company can accomplish things impossible to the larger company, for the reason that it has not yet become generally identified beyond the East as a dangerous rival of the Bell.

Three representatives of the Knickerbocker Company are now in the South trying to secure a controlling interest in the stock of the Southern Bell Company, a sub-company of the Bell Company.

This seems a close approach to the impossible, as the Bell Company's policy is to hold 51 per cent. of the stock of its constituent companies, but the same was also true of the Erie, yet the Knickerbocker people succeeded in getting control of the latter.

The Knickerbocker Company has thus far out-manœuvred the Bell at almost every point. Its resources seem to be enormous, and although generally regarded as merely the instrument of the Telephone, Telegraph & Cable Company, it is nevertheless strong on its own account.

The impending telephone war is expected to break within the year, and it will involve the telegraph companies. Both the Postal and the Western Union have been looking for an available system for the last two years, and it is very evident that they each appreciate the fact that their future depends upon their getting into the telephone business.

Experts estimate that the telephone has cost the telegraph companies at least 50 per cent, of their local business, and the long distance telephone has played havoc with their private wire business.

The Western Union has openly avowed its intentions in that direction, but the other telegraph companies have held their plans in secret.

With the big telegraph companies preparing to go into the field, while the Bell is at war with a rival almost as powerfu as itself and supplemented by the Knickerbocker, there is every reason to believe that the public will soon have telephone service, long distance and local, at about half its present cost.

At the annual meeting of the Michigan Telephone Company the following board of managers was elected: Charles E. Adams and Charles J. Glidden, Lowell, Mass.; Frederick A. Farre, Charles S. Tuckerman and Thomas Sherwin, Boston, Mass.; Frederick A. Forbes and Hugh McMillan, Detroit, Mich.; William J. Latta, Philadelphia, Pa.; Martin Maloney, New York, and Dudley E. Waters, Grand Rapids, Mich. The board elected Charles J. Glidden, president of the Erie Telephone system, president; Charles E. Adams and H. J. Pettingill, vice-presidents; George B. Perham, secretary; Charles A. Garnt, treasurer. The treasurer's report showed gross earnings for the year of \$783,300; net earnings, \$148,250. Five per cent. in dividends have been declared.

The People's Home Telephone Company, which will build a system in Birmingham, Ala., and the surrounding little towns, has commenced work on its plant. The order has been given for its conduits, wires, poles. instruments and other materials. A building permit has been issued the company by the city for the construction of a four-story brick and steel building almost in the heart of the city, which will be used as the exchange.

The stockholders of the Virginia Long Distance Telephone Company met recently in Staunton, Va., for purposes of organization. A charter will be secured and the work of connecting all parts of Virginia and West Virginia will be begun The company is independent of the Bell interests.

The sale of the Fulton Chain (N.Y.) Telephone Company's lines, which was recently reported, has been declared off. D. B. Sperry, the general manager of the company, says that the proposed deal is off, and that there will be no change in the management of the company. Arrangements have been made with the Central New York Telephone & Telegraph Company for a "through" long distance circuit between Utica and Old Forge. The Fulton Chain Company will build a new copper line from Old Forge to Boonville and the Central New York Company will extend its circuit over its line direct to Utica. This will insure prompt and reliable telephone service to all Fulton Chain points.

Carrying out the terms of an agreement, the Erie Telegraph & Telephone Company deposited last week with the Old Colony Trust Company of Boston, Mass., stocks in the five subsidiary companies controlled by the Erie to the par value of \$5,000,000 and estimated market value \$6,500,000 to secure \$1,000,000 Erie debenture bonds due in 1928, already issued and sold. The entire Erie bond issue of \$10,000,000 is now collateral trust bonds, being secured by stocks of the subsidiary companies. The aggregate par value of the subsidiary companies stocks of the Erie system is \$23,000,000 and the estimated market value, based on present prices of telephone securities. is \$30,000,000.

An independent telephone company is being organized in Oakland County, Mich., to give toll rates to every point in the county for 5 cents where now in some cases they are as high as 30 cents. By December the company expects to have every town and hamlet in the county connected. The organizers think this is the solution of the telephone question—each county to organize its own company. The old company recently advanced the Detroit-Pontiac rate from 10 to 35 cents.

Marshfield, Wis., will soon be the telephone hub of Wisconsin, as it is now the railroad center. Lines will at once be built to connect Marshfield with all of the surrounding towns, two independent companies having been organized for this purpose recently. The system will include Wausau, Grand Rapids, Marathon City, Edgar, Fenwood, Stratford, Mosinee, Athens, Pittsville, Bethel, Vesper, Arpin and several other less important points.

The Bell Telephone Company is hard at work establishing its new plant in Columbia, S. C. The new exchange will be on the ground floor of the Kendall building. Owing to the amount of work to be done it is feared that it will be impossible to get the plant in operation before September 1. The new work, it is said, will mean an outlay of some \$20,000, and the employment of a considerably larger office force. The lines will also be extended.

Superintendent Pease of Huntsville, Tenn., has finished the work of equipping the local exchange of the Bell Telephone Company with metallic circuits. Every telephone in the system is now connected with two wires, and the service is much improved.

Notwithstanding the wonderful development, Stockholm Allamanna Telefonaktiebolag (Telephone System) made a net gain of 3,000 subscribers for the fiscal year just closing. Under the able management of its president, Mr. H. T. Cedergren, Stockholm has the largest number of telephones in ratio to population in the world.

The New York Telephone Company is applying to village authorities throughout New York County for permission to put their wires under ground and work has already begun on changing the wires from poles to subways in the western part of the county.

The People's Telephone & Telegraph Company has begun the construction of a telephone line between New Market and Morristown, Tenn. The poles have been distributed Work will be pushed on the line, and it will be completed in thirty days.

At a meeting of the Kearsarge Telephone Company (f Salisbury Heights, N. H., it was voted to increase the calital stock from \$4,000 to \$7,000; also to extend its wires to Andover N. H.

The New England Telephone & Telegraph Company is to string its lines from Rochdale to Worcester, Mass., by way of Auburn, instead of through Cherry Valley and Leicester. The work will begin at once.

The Central New York Telephone & Telegraph Company has a large number of men at work in Rome, N. Y., setting new poles and improving their line in every way.

Telephone communication has been established between Bryan and Rogers Prairie, Madison County, Texas.

### Growth of the Independent Telephone Company.

The rapid growth of the Telephone, Telegraph & Cable Company of America is shown in a circular just issued by the company to its stockholders. Although the new rival of the Bell Telephone Company is less than a year old, it already owns 362 exchanges in twelve States and three large cities, has 128,000 telephones in use, and 17,000 more awaiting connection.

It owns 204,000 miles of wire, 20,000 miles of poles, and there are 65,000 telephone franchises secured and awaiting organization and construction in various towns and cities.

The company has also secured by absolute purchase patents on telephone, telegraph, cable machinery and wireless telegraphy which are considered valuable. It is announced to the stockholders that the company will not pursue the policy of purchasing independent plants, especially those in isolated positions. The board of directors is considering the idea of terminating the assessable feature of the shares under conditions which are regarded as favorable to the stockholders.

Advices from Waterville, Me., state that within the course of a few days there will be organized in that city a telephone company with millions back of it, in which men both in Maine and out will have an interest, the object of the company being to introduce a service into that State far reaching in character. For several months now parties interested in the move have been looking the field over carefully, getting some idea of the cost, the towns to be reached, and taking into consideration details needful for perfecting the plan. The matter has been kept very quiet, and that too with a purpose. It was necessary for the company, in order to nake of the line what was desired to get connections out of the State. It is asserted that arrangements have now been completed whereby connections will be made with the Massachusetts Telephone Company, the Erie Company, and the Telephone, Telegraph & Cable Company of New York. All these organizations will enter into the deal, and by so doing, New England and New York is expected to be well-covered and a splendid system provided for long distance use.

At a meeting of the stockholders of the New England Telephone Company on May 7, it was voted to increase the capital stock from \$15,000,000 to \$20,000,000. The issued capital now amounts to \$13,759,100. The constant increase in the number of subscribers, due in part to the low rates at which the party line and measured service is furnished, has demanded a more rapid enlargement of the company's facilities than ever before, and extensive additions to the property are still required. The directors now order that 17,200 shares be offered to stockholders at par. Each stockholder of record July 9 will be entitled to one share for every eight then held. The right to subscribe will expire at 1 o'clock Saturday, July 28. The company will neither buy nor sell rights. Payment for one-half of the amount sub scribed for is to be made August 16, and the remainder November 16. No interest will be allowed on sums paid in advance.

It is estimated that it would cost \$300,000 to build a municipal telephone system in Detroit, Mich., such as has been suggested.

#### TELEPHONE INCORPORATIONS.

The Gauley Bridge, Summersville & Camden Telephone Company, Summersville, W. Va. Capital stock, \$25,000. Incorporators: E. L. Alderson, A. F. Rader, Dr. J. L. Rader, G. Harlow, A. J. Horaw, all of Summersville.

The Rio & Romney Telephone Company, Romney, W. Va. Capital stock \$2,000. Incorporators: J. L. Shanhaltzer of Stony; R. S. Davis, B. H. Holt, both of Kirby; N. Maphis of Rio; E. L. Blan of Rock Oak.

The North Salem Telephone Company, North Salem, N. Y. Capital stock, \$500. Incorporators: H. Hobart Keeler, Earle C. Bacon, Alfred Howe and David P. Vail.

The Decatur County Telephone Company, Greensburg, Ind. Capital stock \$30,000. Incorporators: J. Shanks, M. Spilman, J. G. Dormill, W. E. Jackson, J. S. Shaw, all of Greensburg.

The Menden Centre Telephone Company — to operate in Menden Centre, Rochester unction and Honeoye Falls, N.Y. Capital stock \$900. Incorporators: Edward P. White, B. H. Cole and Albert A. Lord, Menden Centre.

The Houston County Telephone Company. Houston County, Tenn. Capital stock, \$2,500. Incorporators: J. M. Cooley, J. W. Broadus, W. R. Boon, W.W. Patterson and H. N. Dunbar.

The Co-operative Telephone Company, Coldwater, O. Capital stock, \$2,000. Incorporators: C. F. Morvilus, J. B. Haslinger, J. M. Willhoff, A. Rathweg, P. F. Wearner.

The Kent Home Telephone Company, Kent, O. Capital stock, \$50,000. Incorporators: M. Kent, J. G. Getz, F. L. Allen, G. E. Hinds, W. H. Rutler.



#### GENERAL NEWS.

#### What is Going On in the Electrical World.

#### LIGHTING.

Bay City, Mich.—This city will soon increase the capacity of its electric light plant.

Bridgepore, W. Va.—The Wheeling Electric Light Company of Wheeling, W. Va., has purchased and will rebuild the Bridgeport electric light plant.

Brookhaven, Miss. — This city will spend \$10,000 in improving the water and electric light plants.

Brown's Valley, Minn.-This village recently voted bonds for an electric light plant and waterworks

Cnattanooga, Teun. — The Cnattanooga Light & Power Company will repair that part of 11s plant recently damaged by fire. D J O'Conneil, manager.

Dickson, Tenn. — An election will be held here on a proposition to vote \$25,000 for an electric light and waterworks plant.

Florence, Col.—The Dorcas Mining and Milling Company will install a complete electric light and power plant in its new mill here. The plant will be completed by the middle of Soptember.

Hillsboro, Tex. - On July 24 the voters will determine whether the city is to erect an electric light plant. Holyoke, Mass.-Municipal ownership of the electric

light plant is being considered by the people here.

Indianapolis, Ind.—The Princeton Light & Power Company has increased its capital stock to \$75,000, and the plant will be enlarged and improved.

Lake Olessa, Mich - The village trustees are considering the advisability of obtaining an electric light

Los Angeles, Cal.—The city trustees have published advertisements calling for bids for furnishing the city with an electric light plant, the engine and other machinery to be capable of developing 500 horse power. The bids will be opened July 17.

Lowell, Mich. — At a recent meeting of the stock-holders of the Lowell Water & Light Company, funds were voted for making improvements to the electric piant.

Lyons, Mich. - The Lyons electric light plant has proven too small and the village board wants to build a new plant where more water power can be obtained.

Marion, Ind.—Contracts have been let by the administration of the Suidiers' Home for an electric light plant.

Marshfield, Ore.—The town board is taking steps to put in an electric light plant to be owned by the public.

Mattoon, I.l.—The electric light committee contemplaces the purchase of a 100-light dynamo.

McGregor, Tex.—Walker H. Freeman of this place will put up an electric light plant in the near future.

Newark, N. J -Newark's Free Library trustees will put an electric light plant in the new Library Building, in Washington street, at the head of Washington Park.

New York City.—The purchase of the Edison Electric I. unminsting Company and the Jamaics Electric Ii.ght Company by the New York and Qieens Gas & Electric Company was announced on the 28.n ult.

Niles, O.—Ine Niles Electric Company's lighting plant was lately sold at puolic auction by William T. Hariburt, receiver, to E. A. Wilson for \$7,500.

Ocion, Id.—R. J. Fullerton, T. Holland and C. A. Aspluad have been appointed a special committee to secure estimates, plans, etc., for erecting the proposed municipal electric lighting plant.

Philadelphia, Pa.—In all probability the Hammonton Water Company will make application at the next meeting of the council for an electric light franchise.

Ponca, Neb —It is expected that this place will have

electric lights before the summer is over

Richmond, Ltd. — W. W. Zimmerman, mayor, announces that bids will now be received for plans for an electric light plant to cost about \$100,000.

Saginaw, Mich.—The common council has recently approved the city engineer's plans for a municipal lighting plant and authorized the advertising of bids for the construction of the same at an estimated cost of \$71,820.

Springfield, Ky.-An electric light plant will soon be erected at this place, the necessary funds for that purpose having been subscribed.

Springfield, Mo.-O. Ford and B. M. Shaw, of St. Louis, contemplate the erection of an electric light plant here.

Suffield, Conn.—The Suffield Electric Light Company sameia, conn.—In a sumeid Electric Light Company lately voted to put in meters for their patrons. The officers decided that this is the only fair way, as each consumer will then pay for what he uses.

Valisburg, N. J. — The lighting committee will soon ask for bids for lighting this town.

Vanceburg, Ky. — J W. Mathewson and E. A. Dodge are interested in a new company formed here known as the Vanceburg Electric Light & Power Company.

Wilbraham, Mass.—Rich Hall at Wesleyan Academy is to be renovated this vacation and improvements will be made which will include a new electrical lighting

#### STREET RAILWAYS.

Albert Lea, Minn.—The Albert Lea & Geneva Bailway Company is being organized here to build an electric line from this city to the village of Geneva, a distance of about sixteen miles, and passing through a rich farming

Asheville, N. C.—The Asheville Street Railway Company is considering the extension of its electric line to Biltmore.

Augusta, Me.—The Gardiner & South Gardiner Electric Railway Company has filed with the Railroad Commission a petition for location. It is proposed to connect the city of Gardiner with the village of South Gardiner. The road will form one of the connecting links in the projected system of electric roads between this city and Portland.

Bowling Green, O—A. M. Jordan will confer with the citizers in regard to a line which he proposes building from Oak Harbor to Napoleon. The proposed line passes through this city, Pemberville, Weston and Grand Rapids.

Boyertown, Pa.—Engineers have surveyed the route of the proposed troiley line between this place and Reading. The fact that Samuel A. Bigg went over the route has led to the belief that the Reading Traction Company is interested in the line.

Bristol, Tenn—The Bristol Belt Line Railway Company has secured a franchise to build its proposed electric line G. I. Carter is interested.

Caldwell, N. Y.—It is stated that the proposed trolley road between here and Warrensburg will be under course of construction this month.

Chattanooga, Tenn.—The Chattanooga Electric Railway Company contemplates a number of improvements in its system.

ments in its system.

Columbus, O.—A consolidation of northern Ohio electric railway interests was recorded in the effice of the Secretary of State lately, the Cleveland, Elyria and Western Bailway Company being formed by the consolidation of the Cleveland, Beres, Elyria and Oberlin Railway Company, the Lorain County Railway Company, and Oberlin and Wellington Railway Company. The capital stock of the combined company is fixed at \$2,000,000.

Elyten Md.—Philodolphia capitalists —'Il haild the

Elkton, Md.—Philadelphia capitalists will build the Cherry Hill, Elkton & Cheapeake City Electric Rail-way. The State has made an appropriation of \$58,000 may. Ine State has made an appropriation of \$58,000 towards constructing this road.

Flushing, Mich.—Business men and citizens are in favor of granting a franchise for an electric railroad through this village.

Ft. Wayne, Ind.—The county commissioners have granted a franchise for the electric road from New Haven to this city. Work is to be started within six months. C. W. Orr, W. S. O'Rourke and L. S. Mills are interested.

Ft. Worth, Tex. — Preliminary arrangements have been completed for the erection of the proposed electric railway between this city and Dallas. H. C. Edrington is interested.

Kansas City, Mo.—The stockholders of the Metropolitan Street Railway will hold a meeting on August 6 for the purpose of raising \$2,800,000 for the change of motive power from cable to electric, and for the construction of new lines and extensions of old ones recently authorized by the council. W. H. Holmes is precident. president.

Keene, N. H.—The stockholders of the Keene Electric Railway Company have lately voted to increase the capital stock from \$10,000 to \$80,000.

Mt. Vernon, N. Y.—Steps were taker last week by the New York, Westchester & Connecticut Traction Company to build trolley lines from West Farms to the Bronx, as far east as Bridgeport, Conn., fifty miles

New Haven, Conn.—It is stated officially that the plans have been made by the New Haven Railroad Company for the installation of the suburban electric service in connection with the Union station at Boston. third-rail system of an entirely new

Niles, O.—Elmer Wilson, who with Cleveland parties recently bought out the Niles Electric Light Company, has obtained the right of way for a street railway line from here to the famous Salt Springs, where Philadelphia parties intend building a hotel.

Oakland, Cal.—The application of W. G Henshaw and A. S. Macdonald of this city, for an electric railroad franchise from the line between Alameda and Contra Costa Counties to Point Richmond was discussed by the board of supervisors recently, and it was decided to advertise for bids for the proposed franchise.

Palmer, Mass.—The plans for an electric road from here to Indian Orchard are assuming definite form, and steps are being taken to carry them out.

Stamford, Conn —The application made to the Stamford council for the extension of the trolley line to the Greenwich line has been granted.

Wabash, Ind.—There are encouraging prospects for the construction of an electric interurban line between here and Huatington, this year. F. C. Boyd is the promoter.

West Point, Miss.-T. C. Kimbrough, secretary of the board of trade, is in receipt of a letter from Eastern capitalists wanting to build an electric car line connecting this place and Columbus.

#### MANUFACTURING.

Syracuse, N. Y.-The Myers Break Finder Company of this city was recently incorporated to manufac-ture electrical appliances. The capital stock is \$100,000, and the directors are: Matthew J. Myers, M. Jarvis Myers, Augustus C. Stevens, Francis Myers and John F. Nash, all of Syracuse.

Utica, N. Y.—The Utica Fixture Company is a new concern formed here to manufacture gas and electric light fixtures with a capital of \$12,000. E J Milspaugh, A C. Sieboth and Joseph Rudd of Utica are all interested.

Washington, D. C.—The Cahill Writing Machine Manufacturing Company, which has for years employed a large force of workmen in perfecting its electrical typewriters, is increasing its plant. It is importing additional machinery and workmen to advance the manufacture of its machines.

#### COMPANY MATTERS.

Fairmont, W. Va.—The Fairmont Electric Light Company and the Fairmont Street Railway recently merged into one company. The officers are: President, B. K. McMechen of Wheeling; S. L. Watson, Fairmont, vice-president; J. M. Bailey, John A. Howard, Jere A. Miller, L. C. and C. Powell are the directors.

New York City.—At a meeting of the executive committee of the Manhattan Elevated Railway Company last week, the contract was awarded for the mason work on the company's central electrical power house at 74th street and the East River to M Reed & Co. The amount of the contract is about \$500,000.

Niagara Fall, N. Y. — The Ampere Electro Chemical Company recently leased the old plant of the Union Carbide Company and will soon begin operations in

Pitteburg, Pa.—The American Electrical Works of Providence, B. I., has a contract to supply the Consolidated Traction Company of this place with 42 miles of weather-proof feed cable. The contract amounts to more than 869,000 pounds, and involves a cost of \$100,000

Wilmington, Del.—The adjourned annual meeting of the stockholders of the Wilmington and Newcastle Electric Bailway Company will be held July 9.

York, Pa.—The consolidation of all the electric light and atreet railway companies of this city, under the title of the York County Traction Company, has recently been effected.

#### POWER AND TRANSMISSION PLANTS.

Salt Lake City. Utah. — If the present plans are approved, the Bio Grande Western may build an electric power plant here to furnish power and light to the shop and station buildings and yards.

warwick, Pa.—A syndicate of Philadelphians has purchased the Falls of the French Creek, in Chester County for \$35,000. The object of the new owners is to convert power from the waterfall into electricity, and transmit water and electricity to the towns and villages in that locality. The electricity will be used for supplying heat, light and power to patrons at a distance. Contracts have been secured in Pottstown and Phonixville, and it is expected that business can be done in Norristown. be done in Norristown.

#### MINES.

Cripple Creek, Col.—The Rio Grande sampler will install new machinery soon, including a twenty-five horse-power electric motor, which will give a total capacity of 500 tons per day.—The Gold Coin mine in Poverty Gulch is installing a new electric plant on the heavier hoist.

#### AUTOMOBILES.

Buffalo. N. Y.—A local company was lately organized here with a capital stock of \$600,000, and will start at once to manufacture automobiles. Herbert P. Bissell. William J. Knowles, Charles G Shepard, James A. Roberts, Hiram C. Martin, John J. Gibson and George C. Riley are those interested.

Ft. Dodge, Is.—The business people of this place are rejoicing over the prospect of securing the location of an automobile factory, which will be capitalized at a large figure, and will employ from three to five hundred skilled mechanics. New York capitalists are interested in the matter.

New Orleans, La — Mayor Capdevielle lately received a letter from W. K. Freeman, asking if a site was available in this city for the erection of an automobile factory. He desired he said, to build one that would give employment to 500 hands.

Portland, Me.—The Massachusetts Electric Cab Company is a newly-formed concern in this city with a capitalization of \$470,000, to deal in automobiles. Among those interested are D. H. Jones, J. H. Colby, both of Boston, Mass., and R. Webb of Portland.

St. Louis, Mo.—An automobile company, with head-quarters in New York, is arranging through its repre-sentative, Charles Decker, to piece 500 horseless vehi-cles on the streets of this city. The capacity of these vehicles will be 30 passengers. The cost is estimated at \$2,000 each.



#### ECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources The support are is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem if a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gcn., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

### STOCKS.

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loston, Mass.—July 2			. 001 006	1 % O Ton 15			Lancaster & Col. Electric By West End Street Beilway		•••••	87,500	· · · · · · · · · · · · · · · · · · ·	-:	=
New England Street Rycom North Shore Traction Cocom North Shore Traction Copfd	. 100	4,000,000 2,000,000	4,000,000	6 % S. A. & O.	15 85	16 87	Louisville, KyJuly 2: Louisville Rycom	100		8,500,000	11/4 %., April.	78	79
West End Street Ry. Cocom. West End Street Ry. Co % pid	50	0 10,000,000 6,400,000	9,085,000 6,400,000	8½ % 8., Oct., '99. 4 % 8., Jan.	98 112	\$8½ 114	Louisville Ry	100	2,500,000	2,500,000	2½ % S., Oct. 1,	110	111
oston Elevated B. R	100	10,000,000	1	21/4 % Aug. 99,	139	140	Minneapolis, MinnJuly 2 Twin City Rapid Transitcom		17,000,000			186	6 68 187
rooklyn N. YJuly 2		2,000,000 48,000,000	1,928,400	***********	229 5 ½	270 551/4	Twin City Repid Transit 7 % pfd Montpeal, Canada.—July 2	1	8,000,000	1,112,200	1¼ %, Uei,	1.00	167
rooklyn Rap. Transit Co., ir cerif. cBrooklyn Heights Railroad *dBrooklyn City RRgua:		200,000	200,000	81/4 % Q., Jan.,	107 257	109 289	Montreal Street Ry. Co	100			8 % S., M. & N. 1% % S., J. & J.	100%	261 100
eBrooklyn, Queens Co. & Sub. RB oney Island & Brooklyn RR		2,000,000 2,000,000	2,000,000 1,884.200	2 % % Nov., '99	320	825	Memphis TennJuly 2:			, .			
ings County Elevated	100		4,500,000	1 % July	75	80	Memphis Street Railway Co	100	500,000	500,000		25	-
Assau Electric Railroadpfd	.  50	2,000,000	2,000,000	• • • • • • • • • • • • • • • • • • • •	13		New Haven, ConnJuly 2: Fair Haven & Westville RR	. 2		2,000,00	3 % 8., Sept.	89	41
gBrooklyn, B. & W. E. Railroad. Buffalo N. Y.— July 2	·	1,000,000	1,000,000		Ì		New Haven Street Railway Co New Haven & Centerville Winchester Avenue RR	. 100	700,000	800,000 600,000	0	45	16
Suffaio & Niagara Falls Elec. By Buffalo Railway Co	100			1 % Q. Dec., 99	74 99	75 100	New Orleans, LaJuly 2	*	1,000,000	000,000		"	1
olumbus O.—July 2		' ' '	1		0.5		Canal & Claiborne RR. Co New Orleans & Carrollton RR	100		240,000 1,200,000	1 % S., July, 1 % % Q., Oct.	1485	158
olumbus Street Railroad	10			1 % Q., Feb.	25 88	28 88	New Orleans Traction Co new com	100				22×	96
charleston, S. CJuly 2		1		9 <b>9</b> 9			aCrescent City RRguar bNew Or. City & Lake RRguar	100	2,000,000	2,000,000	8 % S., Jan., 4 % S., Jan., 1 ½ %., June, 1 ½ %. Oct.,	205	26 52
harleston City Ry. Cointerprise City RR. Co	50 25			8 % 8.			Orleans Railroad	50		1,000,000	11/2 %. Oct.,	565	6 67
Chicago, Ill.—July 2 Inleago City Ry. Co	. 10	0 12 000 000	12,000,000	8 % Q., Dec. 81, '99	252	258	New York-July 2: Central Crosstown RR	. 100	600,000	600,00	0 2½ % <b>Q</b> .	270	801
nicago & South Side R. T. RR	. 10	0 10,823,800	0 10,828,800 0 10,000,000		iö	io1/4	Dry Dock, E. Brdw'y & Battery RB	. 100	650,000 1,200,000	650,00 1,200,00	0 2½ % Q. 0 2 % Q., Oct., 0 1½ % Q., Nov. 0 1½ % Q., Feb, 900 0 ½ % A., July, 0 2½ % Q.	100	125
Ietropolitan West Side Elev. Ry Iet.West Side El., pfd	. 10 . 10	0 15,000,000 2 15,000,000	0 7,600,000 0 9,000,000	Feb 28 1900.	27 77	31 78	dMetropolitan Street Ry. Co	r 100	45,000,000 900,000	45,000,00 900,00	0 2 ½ ½ Q.,Feb , 900 0 ½ % A., July,	0. 147 do	174 87
orth Chicago Street RR North Chicago City RR	. 10	0 500,000	ol <b>24</b> 9,900	8 % Q., Jan.	209	210	fBroadway & Seventh Aveguar gOen.Park,N.&E. Rivers RR. gua hEighth Avenue RR	1 100 1 100	2,100,000 1,800,000	2,100,00 1,800,00	0 2 1 9 0 0 0 2 1 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2	199 875	201
Outh Chicago City Railway West Chicago St. RR. Co Juion Traction Bycom	10 10	0 2,000,000 0 20,000,000	18,189,000	1½ % Q., Feb. 35 %	110 17	18	i42d St. & Grand St. Ferry RR.gua jNinth Avenue RRguar	100	750,000	748,00	0 4% % Q.	395	420
nion Traction Coprei	10	0 2,000,000	2,000,00	5 × 8.	64	671	kSixth Avenue RRgua	r 100	2.000.000	2,000,00 600,00	0 4 % % Q. 0 2 % Q., Jan.,	.03 400	210
incinnati, Ohio.—July 2:					1		Second Avenue RR	. 100	2,500,000 12,000,000	10,000,00	0 2 % Q., Jan., 0 \$1.75 p. sh. Feb.	198 1083	201 100
Dineinnati Inc. Plane Bycom Dineinnati Inc. Plane Rypfd Dineinnati, Newport & Cov. St. Ry	. 5	0 1,000,000 0 150,000	0 875,000 150,000		::	76	m42d St., Manhatv'le & St. Nich. A. *Union (Huck) berry) By	100	2,500,000 2,000,000	2,500,00 2,000,00		190	200
Oincinnati Street Ry. Co	·   15	0 8,000,000 0 18,000,000	0 14,000,00	114 % Q., Jan.	75 124 4 126 3	< 12)	Newark N. J.—July 2: Consolidated Traction Co. of N. J	100	15,000,000	15 000 00	0	58	58
Dieveland, Ohio.—July 2	"	0 2,500,00	2,200,000	174 76 42., 3811.	207	12.	North Jersey Traction Co	100	6,000,000	6,000,00		268	4 27
kron, Bed. & Clev. Elec. By Reveland City By	. 10	0 1,000,000 0 8,000,000	1,000,000	34 % Jan. 8-5 % Jan.	48 100	50 101	Pittsburg, PaJuly 2:	1					-"
leveland Electric By DetPoit, Mich.—July 2.	10	0 12,000,00	12,000,00	14 X Q., Oct., '99	. 87	8734	Allegheny Fraction Cocom Consolidated Traction Copfd	. 50	500,000 15,000,000	500,00 15,000,00	0 2 %, Jan.	55 243	
etroit Citizens' Street By	1 40		1,250,000		1003	٠.	pCentral Traction CoqOitizens' Traction Co	- 50	9,473 850 1,500,000	9,000,00	0 1 % Nov.	69	1 70
74. Wayne & Belle Isle Ry Rapid Railway Co Deiroit Electric Railway	.	250,000		0	175 90	100	*Pluquesne Traction Co	50	8,000,000 8,000,000	18,000,00	0 6 % A. 0 8 ½ % Nov	123	1 12
Wyandotte & Detroit River Ry	iö	0 1,000,000 250,000	1,000,000 200,000		100	iio	Federal St. & Pleasant Valley Ry.	. 2	1,400,000 8,000.000	1,400,00	0/2 %, Jan. 0/3 %, Nov. 0/1 % % Nov. 0/1 % % Nov. 0/6 % A. 0/8 %, Nov. 0/2 %, July, 0/2 %, Aug. 0/1 %, Oct. 0/5 % A., June 0/5 % A., June	27	2 29
Dayton O.—July 2 Dity Railway Cocom	10	0 1,500 000	1,470,60	11 % Q.	140	145	Pittsburg & Birmingham Trac. Ry.	2:	1,500,000	1,500,000 8,000,000	0 1 %, Oct. 0 5 % A., June	41	42
Dity Railway Copfd People's Street Railway	I. 10	0 600,000	1,470,600 600,000 1,100,000	12 % Q.	170 114	115	United Traction Copref	. 50	17,000,000 8,000,000			513	14

\*Unlisted. † Ex div.
a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltin ore. The pref stock of U R & Elec. Co. has been issued in the form of income bonds. b Lessed to B ston Elevated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Lessed to Brooklyn Rapid Transit Company; road operated by Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
Stock owned by Kings County Traction Company; road lessed to Nassau Electric RR g Owned by Atlantic Ave RR and lessed to Nassau system.
h \$50 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co., Controls by lesse Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
j \$5 % per shnum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$625,100 of tock ownet by West Chicago Street Railroad Company; \$625,100 of tock ownet by West Chicago Street Railroad Company; \$625,100 of tock ownet by West Chicago Street Railroad Company; \$625,100 of tock ownet by West Chicago Street Railroad Company; \$625,100 of tock ownet by West Chicago Street Railroad Company; \$625,100 of tock ownet by West Chicago Street Railroad Company; \$625,100 of tock ownet by West Chicago Ompany; \$625,100 of tock ownet by West Chicago Ompany; \$625,100 of tock ownet by West Chicago Ompany; \$625,100 of tock ownet by West Chicago Ompany; \$625,100 of tock ownet by West Chicago Ompany; \$625,100 of tock ownet by West Chicago Ompany; \$625,100 of tock ownet by West Chicago Ompany; \$625,100 of tock ownet by West Chicago Ompany; \$625,100 of tock ownet by West Chicago Ompany; \$625,100 of tock ownet by West Chicago Ompany; \$625,100 of tock ownet by West Chicago Ompany; \$625,100 of toc

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#### PASSENGER RAILWAYS.

#### TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Authorz'd		Bate and Date of Last Div.	Eid.	Asked.	NAME.	Par	Capital	Stock.	Rate and Date of Last Div.	Bid,	Ankei
N: w Bedford Mass-July 2 nion Street Railway Co	100	\$850,000	\$850,000	2 %, Feb.	160	165	Boston, MassJuly 2 American Bell Telephone Co	100	50,000,000	28,650,00	1 % Q., Jan. 1 % Q., Feb 20,	298	800
Northampton, Mass-July 2 Northampton Street Bv	100	800,000	225,000	4 % A., June.	170	178	New Monk - July 2	100	10,894,600	10,804,60	\$1.50 p. sh. Feb	180	181
Omaha, Neb July 2 Omaha Street Ry		5,000,000	5,000,000	3 % A. and N.	55	65	New York.—July 2 American Telegraph & Cable Co *Central & South Am. Teleg. Co	100 100	14,000,000 6,500,000 10,000,000	14,000,000	1××9	91 104	94 106
Paterson Rv. Co		1,250,000	1,250,000	***************************************	54		Franklin Teleg. Co2½ % guar. Erie Telegraph & Telephone Co	100 100 100	1,000,000	10,000,000	1% % Q. 1% % S.	165 42 112	170 52 118
Providence, R. IJuly :				% %, Oct. '98	109	111	*Gold & Stock Telg. Coguar. 6 %.  *International Ocean Tel Coguar 6 % Mexican Telephone Co	100 100	5,000,000 8,000,000	******	12 % 8. 1 % Q., Feb., 1 % Q. 1 % Q.	118	128
United Traction & Electric Co Philadelphia.—July 2					28	24	*New York & New Jersey Tel. Co *Pacific & Atlantic Telegguar. 4 %		2,000,000 5,000,000 2,000,000	8,728,000	2½ % Q., Jan., '99.	168 70	21/4 174 95
Fairmount Park Trans. Co 50 pd. Hestonville, Man. & Fairmount Hest'nvl'e, Man. & Fairm't. 6 % pfd.	50 50	1,966,100 588,900	1,956,100 1588,900	2 %, Dec. '\$9. 2 % %, July 15, '\$9. 8 % 8—July, '99. 8 % Feb. 1, '\$9.	47 75	48 76	*Postal Telegraph Cable Co* *Sout'n & Atlantic Telg. Co.guar.5 % †Commercial Union Telegraph Co	100 25 25	950,000	15,000,000 559,525 500,000	1 % Q. 2½ % S. 8 % S., Jan., '99. 1½ %, Q., Jan. '99.	95 115	100
aFairmount Pk. & Had. Pass. Ry. Cnion Traction Co \$12½ pd & Electric Traction Co	90	80,000 000	29,980,450 8,297,920		35	76 3 ½ 	Western Union Telegraph Co †Div. guar. by Postal Teleg. Co.	••	•••••	97,870,000	1¼ %, Q, Jan. '99.	791/	80
dCitizens' Passenger Ry Frankford & Southwark Pas. R (Lehigh Avenue Ry. Co	50 50 50		11,875,000	\$8 share Q. \$14 sha'e A—Apr.\$9	845 450 48	451	Miscellaneous.—July 2: American Dist. Teleg. (Phila.) Bell Teleph. Co. (of Canada.)	25 100	400,000 8,960,000		1 % Q.	26 188	87
Lombard & South Street Ry	25 50 50	1,060,000	†771,076	A. & O. \$9 share A, Mar. 98	90 800	90%	Chesapeake & Potomac Telep. Co Chicago Telephone Co	100 100				61 200	66 210
ePeople's Traction Co	50 50	1,500,000 500,000	572,800 150,000	8 %, A., April, '98. \$5.25 share—1898. 8 % Jan., 1898.	151	151 152	Central Dist Prig & Telg.Co.(Pgh.). Empire & Bay States Telegraph Co. Hudson River Telephone Co	100	2,000,000	2,000,000	1 × Q.	148 79 113	150 80 120½
hPeople's Passenger Rycom. hPeople's Passenger Rypfd. (Philadelphia Traction Co	25 	750,000	740,000 277,402 20,000,000	\$2 p. sh., Oct. 98.	96	961/4	*Northwestern Telegraph Coguar Providence (R. I.) Teleph. Co Southern New Eng. Teleph. Co	50 50 100	2,500,000 8,000,000	2,500,000	2¾ % Q.		125 95
Ontinental Pass. Ryguar	50 50 50	1,000,000	400,000 580,000	6 % A-Mar., '98. \$6 share—July, '98.	158	157	ELECTRIC LIGHT				OAL MFG	.0	os
Empire Passenger Ry. Co Philadelphia City Pass. Ry Philadelphia & Gray's Fy. RR	50 50	1,000,000 1,000,000	298,650	\$7.50 share July '98	100	208½ 309	Boston, Mass.—July 9: Fort Wayne Electric trust receipts					115	125
Ridge Avenue Passenger Ry Philadelphia & Darby Ry.guar.	50 50 50		200 000	\$12 share, July '98. \$2 share July, '98. 1½ % S., July, '98. \$11 sh. A., July, '98.	***	••	Ft. Wayne Elec Co. T. Sec. Series A. †General Electric Co. [old] com.	25 100	40,000,000	80,460,000	2 % Q., Aug., 1898. 1% % Q., Jan., 1900	86	48
Thirteenth & 15th Sts. Pass. Ry. Union Passenger Ry. Co	50 50 50	1,500,000	1900,000	\$11 sh. A., July, '98 \$9.50 shre, July '98 \$10 share, July '98	203	240 268	General Electric Co. [new] " TH. Elec. CoT. Secur., Series D. Westinghouse Elec. & Mig.Co.com.	50		146,700		97	127½ 77½ 45
Rachester, N. YJuly 2				V20 33445,5		15	Westinghouse El. & Mig. Co. pid. Westinghouse El. & Mig. Co. assent.	50	4,000,000 11,000,000	8,996,058 8,195,126	1% % Q., Jan.,	82 44	621/2
Reading, PaJuly 2			5,000,000	,,,,,,,,,,,,,	16	17	New York.—July 2: Edison Elec. Ill'g Oo., New York *Edison Elec. Ill'g Oo., Brooklyn	100 100	9,188,000	7,988,000		119	120
j seading Traction Co	DU	1,000,000 850,000	1,000,000 850,000 \$1,000,000	Semi-an.,Jan. & Jy Jan., '98.	24 138 70	26	Edison Ore Milling Co	100	4,000,000		11/4 % Oct., '98.	8 82	12 92
St. Louis MoJuly 2 Fourth Street & Arsenai Ry							General Electric Co. [old]com.   General Electric Co. [new] "   Interior Conduit & Insulation Co	100 100 100	40,000,000 18,276,000 1,000,000	30,460,000 18,276,000 1,000,000	2 % Q., Aug., 1898. 1½ % Q., Jan., 1900.	127	1271/4
Jefferson Avenue Ry. Co	50 100	400,000 2,500,000	400,000 2,400,000	2 % Dec., 1888. 1¼ % Jan., '99. 1½ % Jan. '99.	::	::	Pittsburg, PaJuly 2	100	2,500,000	2,500,000	A. & O.	110	125
National Railway Co	100	2,500,000 2,500,000 2,000,000			::	::	Allegheny County Light Co  East End Electric Light Co	100 50	500,000 800,000	500,000 800,000	J. & J.	168	172
St. Louis RR	100 50 50	2,000,000 2,400,000	2,000,000 2,800,000	4 %, Oct., '98. 2½ %, Jan., '99. 1½ % Jan., '99. 50c., Dec., '89.	::	::	Philadelphia, Pa.—July 2 Edison Electric Light Co	100	2,000,000		17-17-17	144	144%
United Electric Ry 6 % pref.	50 100	500,000 1,000,000	1.000.000	a %. Jan., '99.	20½ 69 68	21 71 10	*Electric Storage Battery Cocom. *Electric Storage Battery Copfd. Northern Elec. Light & Power Co	100 100 10	8,500,000 5,000,000 550,000	550,000	The state of the s	70 75 18	18%
t. Louis & Suburban Ry Union Depot RR	100		4,000,000	8 % A., July, '19	**		Southern Elec. Light & Power Co  Miscellaneous.—July 2	10	187,500	187,500	To other	80	
San Francisco, Cal. – June. California St. Cable RR Geary Street Park & Ocean RR	100 100		600,000 875,000	50c. monthly. 82.50 share, '96.	117 50	119	Bridgeport (Conn.) Elec. Lt. Co Missouri-Edison (St. Louis)com, Eddy Electric Mfg. Co	25 25	500,000			47 20	48 21 14
Market Street Ry	100 100	18,750,000	18,750,000 550,000	Q., 60c. per share.	611/2	68 16	Hartford (Conn.) Lt. & Power Co	25	850,000 175,000			10 150 6	155 10
Scranton Pa -July 2 Scranton Railway Co	50		2,500,000	******	29	80	New Haven (Conn.) Elec. Lt. Cc Narragansett (Prov., R.I.) Elec. Co. Bhode Island Elec. Protec. Co	100 50 100	100,000 1,200,000		2 % Q., Oct.,	195 98 1184	100
m Scranton & Carbondale Trac. Co m Scranton & Pittston Traction Co Springfield Ill.—July 2	100 100		500,000 1,050,000	*****************	16½	**	Royal Elec. Co. (Montreal) Toronto (Canada) Elec. Light Co Thomson-Houston Welding Co	100	1,000,000 1,085,000	1,085,000		201	202 .828/4 100
Springfield Consolidated Ry	100	750,000	750,000	*********	****		Woonsocket (R. I.) Electric Co	100	the stock	Aldana Al		105 s red	106 uced
Springfield OJuly 2 Springfield Street By	100	1,000,000	1,000,000	***********		11	to \$20,827,200, of which \$18,276,000 is con Recently acquired the Edison Illipany, the Municipal Electric Light	omn	ion and \$2	2.551.200 m	referred.	IEX	div.
Springfield, MassJuly 2 pringfield Street Ry	100	1,200,000	1,166,700	8 % A.	207	212	ALLIE		NDU	STRIE	s.	NO.	
Toronto Canada.—July 2: 1 Toronto Street Ry	100		6,000,000		100	1001/2	Boston Mass.—July 2: American Electric Heating Co	50	10,000,000		A SAME A		
Montreal Street Railway Co Washington, D. CJuly 2		4,000,000	4,000,000	4 % 8.	260	261	Street Ry. & Illu'g Propertiespid United Electric Securities Copid.	100	4,500,000	1,248,700 1,000,000	\$2 p. sh. Jan. 28, '99 \$8.50 p.sh. Nov '99	-	100
Belt Ry. Co	50 100 50	112,000,000	500,000 12,000,000 400,000	65c. per sh, Oct. 19.	1041/4	105	New YorkJuly 2:			1	125-1-26	190	
Joiumbia Ry. Co	50 50	707,000 200,000	652,000 200,000		85 15	40 · 16	Consolidated Electric Storage Co Safety Car Heating & Lighting Co	100				8 150	12
Worcester, MassJuly 2			458,900	2⅓ % Q.	**		Worthington Pump Copfd	100 100	5,500,000 2,000,000	5,500,000 2,000,000		- VYVV	110
*Worcester Traction Co6 % pfd. Worcester & Suburban Street Ry	100 100 100	2,000,000	8,000,000 2,000,000 542,500	8 % S., Feb., '98. 4½ %, 1897.	81 1042	82 106 85	Philadelphia PaJuly 2 Electro Pneumatic Trans. Co	10	1,500,000		1 501 20	21/2	8
Wilkesbarre & Wyoming Val. Trac.							United Gas Improvement Coscrip. Welsbach Commercial Cocom. Welsbach Commercial Copfd.	50 100 100	10,000,000 8,500,000 500,000		2 × Q	22 78	162 28 75
* Unlisted. † Paid in. ‡ Full	paid	.   Outst	anding.	Ex-div.	25	29	Welsbach Light Co	5	525,100 500,000			134	44
a Leased to Hestonville, Mand b Consolidation Electric, Pec- charges and all indebtedness of	nle's	and Ph	lladelphie	Traction compar	ies	Hived	OBIDOIUMOUM Mig. Oo	100	200,000	200,000			100
Traction Company. c Practically all shares owned d Lease to Frankford & South	by T	Inion Trac	tion Com	nany			MiscellaneousJuly 2	196	1,000,000	1,000,000	9		192
Controlled by Frankford & S	omp	any. wark Pass	enger Ra	lway.	20010		Barney & Smith Car Cocom. Barney & Smith Car Copfd. Billings & Spencer Co	100 100 25		1,000,000 2,500,000	17	141/4 104 82	107
g Leased to People's Passenger h Majority of stock owned by i Leased to Union Traction Con	npar	DV.	-	any.			Jonsol, Oar Heating Oo	100	1,250,000	1,250,000	1%% Feb	105	62 109
j Lease transferred to Union T jj Leased to United Traction C p.s. \$20,000 in 1899-1900 and \$80,000 declared as a dividend semi-annu	omr	anvat a	rental of	\$10,000 per annum	in in i	1866-7-8	Pratt & Whitney Copfd	100				40	50 50
declared as a dividend semi-annu- k Dividend of 10 % guaranteed Dividend of 6 % guaranteed	by I	Reading T	raction Co	ompany.	- 31		Stillwell-Bierce Copfd shults Belting Co st. Charles Car Co	-	500,000	******	2 % Sept 1,'99.	80	65 90 106
Lessed and operated by the	dran	ton Railw	ay Co., fo	rmerly Scranton T	ractio	on Oo.	Unlisted.			-	and the second second		DE.

### BONDS.

PASSENGER RAILWAY.							PASSENGER RAILWAY.						
Amount.													
NAME.	Authorised.	Issued.		Interest periods.	Bid.	Asked.	HAMP.	Authorized.	Issued.	Due	Interest periods.	Bid.	Ada
Albany N. Y.  Date of Quotation—July 2, 1900  The Albany Ry. CoCons. mig. 5s. The Albany Ry. CoGen. mig. 5s. Watervleit Turnpike & RR.1st mig. 6s Watervleit Turnpike & BR.2d mig. 6s. Proy Oity Railway Co	850,000 150,000	427,500 875,000 850,000 150,000	1980 1947 1919 1919 1942	J. & J. M. & N. M. & N. M. & N.	*117½ *117 *125 *128 *116½	127½ 127	New Orleans L2.  Date of Quotation—July 2, 1900.  Canal & Claiborne RB cons mig. 8s. Crescent City RR lst mig. 6s. Crescent City RR lst mig. 6s. New Orleans City RR lst mig. 6s. †N. Orleans City & Lake RR. lst mig. g. 5s. N. Orleans & Carroliton RR. 2d mig. g. 6s. Orleans Railroad Co Cons. mig. 6s. 15st. Charles 8t. RR. Co lst. mig. 6s. 15428.500 in escrow to retire New Orleans City RR. Co.'s 1st mig. bonds.	\$150,000 5,000,000 416,500 5,000,000 850,000 800,000	\$150,000 50,000 8,000,000 29,000 2,599,500 850,000 800,000 75,000	1899 1948 1908 1948 1907 1912	J. & D. J. & J. F. & A. J. & J.	105½ 118 112	112 118
Baltimore Md.  Date of Quotation—July 2, 1900  United Electric Ry. Coist mig. g. 4s.  """""""""""""""""""""""""""""""""""	88,000,000 14,000,000 2,000,000 1,250,000 1,750,000 750,000 96,000 96,000 8,000,000 8,000,000	18,000,000 1,500,000 1,250,000 1,250,000 1,780,000  117,000 580,000 8,000,000 1,000,000	1949 1911 1929 1901 1942 1900 1906 1912 1982 1922	J. & D. M. & N. M. & N. M. & S. J. & D. J. & J. N. & M. J. & J. M. & N. J. & D.	102 74% 118% 119 104% 121 101 102% 119 116 117	102½ 95 120  121½  121 117	\$\$20,000 outstanding.  New York.  Date of Quotation—July 2, 1900.  Atlantic Ave. (Brooklyn) Imp. g. 5s. Atlantic Av. (Brooklyn) Issgen. mig. 5s. Atlantic Av. (Brooklyn) Cons. mig. 5s. IBro'dway & 7th Ave 1st mig. 5s. Broadway & 7th Ave 2d mig. 5s. Broadway & 7th Ave 2d mig. 5s. Broadway & 1st Ave 2d mig. 5s. Broadway Surface 1st mig. 5s. Brooklyn City RR. Co Ist cons. mig. 5s. Brooklyn City & Newtown 1st mig. 5s. Brooklyn, Bath & W.E. RR. Gen. mig. 5s. Brooklyn Heights RR 1st. mig. 5s. Brooklyn, Q's Co. & Sub'n 1st mig. 5s. Brooklyn, Q's Co. & Sub'n 1st cons. 5s. Brooklyn, Q's Co. & Sub'n 1st cons. 5s. Brooklyn, Q's Co. & Sub'n 1st cons. 5s.	1,500,000 1,500,000 1,125,000 1,000,000 2,000,000 1,000,000 2,000,000 250,000 4,500,000	1,125,000 1,000,000 6,000,000 2,000,000 448,000 250,000 8,500,000 2,750,000	1909 1981 1948 1904 1914 1924 1905 1941 1989 1988 1941 1941	J. & D. J. & J. J. & J. J. & J. J. & J. J. & J. M. & N.	95 107 % 115 128 104 108 115 106 116 116 116 117	110 118 128 100 110 113 106 113 116
### All of the bonds of the above ompanies, marked †, have been as umed by the United Railways & Electic Company.  BOSTON, MSSS.  Date of Quotation—July 2, 1900 Lynn & Boston RR list mig. g. bs Vest End Street Ry Deben. g. 58 fs. fsl. 674,000 in escrow to retire outstand ag bonds of absorbed companies.  Charleston S. C.  Bate of Quotation—July 2, 1900.  Enterprise Street RR	5,879,000 8,000,000 2,000,000	8,702,000 8,000,000 2,000,000	1902	J. & D. M. & N. M. & S	114 1041/4 112	115 106	Brooklyn Rapid Transit gold 5s. Bleecker St. & Fuli'n Fer'y RR. Ist mtg. 7s. Cent P'k. N. & E. R. RR. Ist cons. mtg. 4s. Central Crosstown RR Ist mtg. 6s. Coney Island & Brooklyn RR. Ist mtg. 6s. Dry Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s. Dry Dock, E. Bd'y & Bat'y R. serips. 6s. Eighth Av. RR. Co Cert. indebt. 6 %. 42d St., Man. & St. Nich. Av Ist mtg. 6s. 42d St., Man. & St. Nich. Av Ist mtg. g. 5s. Metropolitan St Ry Co gm. cl. tr. g. 5s. Second Avenue Ry Gen. cons. mtg. 5s. Second Avenue Ry Gen. cons. mtg. 5s. Second Avenue Ry Ist mtg. 6s. Sieinway Ry. (L. I.) Ist mtg. g. 6s. South Ferry RR. Co Ist mtg. 5s. Twenty-third Street Ry Ist mtg. 5s. Twenty-third Street Ry Ist mtg. 5s. Twenty-third Street Ry Lab. 5s.	7,00.000 1,200,000 1,200,000 800,000 1,000,000 0,000 0,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000 1,500,000	800,000 980,000 1,100,000 1,200,000 1,500,000 5,000,000 1,500,000 1,500,000 1,600,000 350,000 5,000,000	1900 1902 1922 1908 1982 1914 1914 1915 1998 1997 1909 1922 1919 1987	J. & D. M. & N. J. & J. J. & D. F. & A. F. & A. M. & S. F. & A. M. & S. F. & A. J. & J. J. & J. J. & J. J. & J. J. & J.	109% 91% 107 125 101 117 102 108 116% 89 124 120 120 118% 116 110%	10 10 12 10 11 11 12 10 11 11 11 12
Chicago III.  Date of Quotation—July 2, 1900.  Dhicago City Ry	6,000,000 400,000 7,500,000 1,000,000 4,040,000 1,7,574,000 15,000,000 2,500,000 2,500,000 2,500,000 4,040,000 1,000,000 2,500,000 2,500,000 2,000,000	500,000 2,500,000 8,969,000 700,000 6,000,000	1908 1929 1929 1907 1982 1928 1942 1906 1911 1900 1927 1928 1911	J. & J. J. & J. F. & A. J. & J. J. & J. M. & N. M. & N. J. & D.	1013/4  1081/4 96 106  108 101 1068/8	23/4 102 109 96/4  111 102 107	Union (Huckleberry) Ry 1st mig. 5s. 11 Westchester Electric RR 1st mig. 5s. 141,035,000 in escrow to retire gen. mig. bonds. 134,850,000 in escrow to retire maturing obligations. 13552,000 in escrow to retire lat and 2c mig. bonds. 2In treasury. \$80,000. 11 Guar. by Union Ry. Co.  TOPONIO Canada.  Date of Quotation—July 2, 1900. Montreal St. Ry	500,000 500,000 2,500,000 4,550,000	\$00,000 2,200,000	1948	M. & S. M. & S.	118	11
W. Ohicago St. RR. TunnelIstmig. St. Redeemable at option on 60 da. notice fFunded debt assumed by Ohicago Wiv. Ry. Co., controlling interest orhich is owned by W. Chicago St. RR. Ohiche is owned by W. Chicago St. RR. Ohicago St. RR. Inc. Con. Int. St. Ry. Adams & Rden P'k In Ist mig. 66 Mt. Adams & Rden P'k In Ist mig. 68 Mt. Adams & Rden P'k In Ist mig. 68 Ohicago St. Ry	58 8,000,000 46,000 5. 100,000 581,090 8. 250,000 8. 400,000	2,500,000 48,000 581,000	1922 1900 1906 1906	J. & J. A. & O. A. & O. M. & S. J. & J.	114 ½ 108 ½ 114 108 ½ 121 ½ 182 ½	104	Date of Quotation—July2 1900 Continental Pass. By	8 100,000 8 150,000 8 50,000 1,1,25,000 5,698,210 200,000 1,1800,000 500,000 29,785,000 250,000 29,785,000	810,000 200,000 100,000 458,000 867,000 1,018,000 1,018,000 100,000 29,724,876 246,000 750,000	1900 1898 1901 1902 1911 1912 1948 1910 1908 1911 1908	J. & J. J. & J. J. & J. J. & J. J. & J. J. & S. J. & A. & O. A. & O.		
Cleveland O.  Date of Quotation – July 2, 1900.  Brooklyn Street RR. Oolst mtg. 5: Jin. New't & Cov. St. RyCons. mtg. 5: Jin. New't & Cov. St. RyCons. mtg. 5: Jin. Street Rylst mtg. 5: Oleveland City Cable Rylst mtg. 5: Jolumbus (O.) Cent. Rylst mtg. 5: Hast Cleveland RRlst mtg. 5: Tt. Wayne (Ind.) Elec. Ry. Ist mtg. 5: St. Ry. Oo., Grand Rapidslst mtg. 5: St. Ry. Oo., Grand Rapidslst mtg. 5: St. Ry. Oo., Grand Rapidslst mtg. 5: st. 151, 900,000 in escrow to retire bonds of absorbed companies, marked a.  Interest guar. by Cons. St. Ry. Co.  Detroit, Mich.	8-8,000,000 8-2,000,000 8-8,500,000 9-1,500,000 1,000,000 8-1,000,000 8-200,000 9-1,600,000	2,500,000 2,000,000 1,249,000 1,500,000 1,000,000	1922 1909 1918 1918 1910 1922 1915	M. & S. M. & N. M. & S.	106 ½ 118 ½ 105 ½ 106	107 114% 106 107	Pittsburg, Pa.  Date of Quotation – July 2 1900  Birmingham, Knox & Allentown6s Central Traction Co1st mig. 5s "Duquesne Traction Co1st mig. 5s "Fed'l St. & Pleas. Val. Jack's Run5s Fed'l St. & Pleasant Valley0ons. 5s Fed'l St. & Pleasant Valley	1,250,000 1,500,000 50,000 1,250,000 250,000 750,000 1,500,000 1,500,000 1,500,000 1,500,000 2,500,000	500,066 875,000 1,250,000 1,500,000 1,250,000 750,000 750,000 1,500,000 500,000 1,400,000 2,032,036 500,000	1980 1921 1980 1918 1942 1920 1920 1920 1980 1980	J. & J. J. & J. J. & J. J. & J. J. & J. M. & N. J. & J. J. & J. J. & J.	1111/4	11
Date of Quotation—July 2, 1900. Detroit Citizens' St. Ry	8. 400,000 8. 1,800,000	8,885,000 877,000 1,800,000	1902	A. & O. A. & O. J.&D.	105	1021/4	Providence R. I.  Date of Quotation Juyl 2, 1900	50,000	50,000	1910	J. & D. M. & S.	116	1
Date of Quotation—Juyl 2, 1500 New Haven St. Rylst mtg. g. 5t New Haven (Edgewood Div.) lst. mtg. 5t Winahester Avenue RR—lst mtg. g. 5t Winahester Avenue RR, Deben. g. 5s	7. 250,000 1. 100,000	260,000	1914 1912		111 111 109		Date of Quotation—Juyl 2, 1500, Baden & St. Louis RRlst mtg. 5s Cass Ave. & Fair Gds Rylst mtg. 5s Citizens' Railway Colst mtg. 5s Comp. Hts. Un. De. & Mer. Ter_lst	1,818 000	250,000 1,818.000 1,500,000 000 00	1913	J&J	101% 101% 109	10 10 11 11 11

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PASSEN	GER	RAILW	AY	•		
	Ame	ount.	Ī	Interest		
HANE.	Authorized	. Issued.	Due			Anked.
St. Louis.		İ				
Date of Quotation—July 2, 1900  Jefferson Avenue By	400,000	400,000	1900	M. & N	. 108	105
Lindell By. Co	1,000,000	1,500.000 700,000 800,000	1916	F. & A.	.   105	109 106
Mound City RB. Colst mtg. 6s. People's RR. Colst mtg. 6s. People's RB. Co2d mtg. 7s.	400,000 125,000 75,000	125,000	1902	A. & O. J. & D. M. & N		102
People's RR. CoCons. mtg. 6s. St. Louis & E. St. L. Electric.1st mtg. 6s.	1,000,000 75,000	800,300 75,060	1904 1905	J. & J. J. & J.	100	101
St. Louis & Sub. Bylst mtg. 5s. St. Louis & Sub. ByIncome 5s.	2,000,000 2,000,000 800,000	2,000,000 1,400,000 800,000	1921	F. & A.		100% 104 84
††Southern Electric ByCons. mtg. 6s. †Taylor Avenue St. Bylst mtg. g. 6s.	500,000 500,000	500,000 500,000	1909 1918	M. & N. J. & J.	. 106 116	108 118
<ul> <li>Union Depot RR. Co1st cons. mtg. 6s.</li> <li>Union Depot RR. CoCons. mtg. 6s.</li> </ul>	1,091,000 8,500,000	1,091,000			100 121	100% 122
†Controlled by St. Louis BR. Co.  Controlled by Union Depot BR. Co.  Controlled by Lindell RR. Co.			1			
\$200,000 in escrow to retire 1st & 2d			1			
38/00,000 in escrow. ft\$200,000 in escrow to retire 1st mtg.		-			1	
San Francisco Cal.		ļ				
Date of Quotation—June, 1900.  California St. Cable BRlst mtg. g. 5s.  †Ferries & Cliff House Bylst mtg. 6s.	1,000,000 650,000	900,000 650,000	1915 1914	J. & J. M. & S.	114	117
Geary St., Park & Ocean BBlst. mtg. 5s. Market St. Oable By. Colst mtg. g. 6s.	1,000,000 8,000,000	8,000,000	1921	A. & O.	1263	95
†Metropolitan By. Co	200,000 2,000,000 850,000	2,000,000 850,000		A. & O. J. & J.	126%	107
†Park & Ocean BBlst mtg. 6s. †Powell St. Bylst mtg. 6s.	250,000 700,000	250 000 700,000	1914 1912	J. & J. M. & S.	1051/6	125
†Oontrolled by Market St. Ry. Co.	1,000,000	900,000	1918	M. & N.	• • • •	•••••
Washington D. C. Date of Quotation—July 2, 1900	<b>#</b>					
Belt Ry. Co	500,000 500,000 200,000	500,000	1920 1914 1911	J. & J. A. & O. J. & D.	182	••••
Eckington & Soldiers' Home, mtg. 6s. Metropolitan BB. CoColl. tr. cons. 6s. †\$50,000 in escrow to retire 1st mtg.bds.	500,000		1901	J. & J.		******
Miscellaneous.  Date of Quotation—July 2, 1900.						
Bridgeport Traction Colst mtg. 5s. Buffalo (N. Y.) By. CoCons. mtg. 5s.	2,000,000 5,000,000	1,688,000 8,548,000		J. & J.	108	110
†( 'tizens' St. R. (Ind'polis).lst cons.m.5s !Orosstown St. Ry. (Buffalo).lst. mtg.5s.	4,000,000 8,000,000	8,000,000 2,366,000	1933	F. & A. M. & N. M. & N.	118 104 112	105 118
Consolidated Traction (N. J.)lst mtg.5s. Consolidated Traction (N. J.)lst mtg.5s. Crosst'n St. Ry. (Colu's, O.)lst mtg.g.5s	8,000,000 15,000,000	2,261,000 18,965,000	1933	J. & J. J. & D.	115 1111/4	111%
Denver Oity Cable Rylst mtg. g. 6s. Denver Con. Tram'y CoCon. m. g. 5s. Louisville (Ky.) Rylst cons. mtg. g.5s.	4,000,000 4,000,000 4,000,000	572,000 8,800,000 922,000	1920	J. & D. J. & J. A. & O.	115 20 80	115%
Louisville (Ky.) Rylst cons. mtg. g.5s. Minneapolis St. Rylst cons. mtg. g. 5s ftNo. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	6,000,000 5,000,000	4,981,000 4,050,000	1930 1919	J. & J. J. & J.	119 110¼	1191/4 1101/4
No Hudson Co Ry (N I) 2d mtg Kg	8,000,000 550,000 500,000	2,878,000 550,000 489,000	1928	J. & J. M. & N. F. & A.	108	•••••
No. Hudson Oo. Ry. (N. J.)Deb. 6s. Paterson (N. J.) ByOons. mtg. g. 6s. Rochester (N. Y.) Ry	1,250,000 8,000,000	1,000,000 2,000,000	19 <b>31</b> 19 <b>8</b> 0	J. & D. A. & O.		
St. Paul City RyDob. g. 5s. St. Paul City ByDeb. g. 6s.	5,500,000 1,000,000	4,298,000 1,000,000		•••••	105% 108	106
†\$1,000,000 in escrow to retire 1st and d mig. bds.				•		
1\$800,000 in treasury. Bonds guar, by Buffalo By. Co. 1\$760,000 in escrow to ratire bonds of						
O. St. RR. Co. 1887,000 in treasury.						
\$8960,000 res'ved to redeem prior liens.	}				*****	
ELEOTRIO LIGHT AND	ELE	OTRIO	AL		With i	os,
Boston, Mass.  Date of Quotation—July 2 1900						
Delaware Gas Lt. Co.,lst m. 5s, g.	800,000 2,026,000	800,000		J. & J. Quar.	106 157	103
	10,000,000	8,750,000	1922		116	
Date of Quotation—July 2, 1990 Allegheny County Light Co	500,000		1911 .	J. & J.	110	
Westinghouse Elec. & Mig. Co. Scrip 6s.	195,570			M. & 8.		
	4,812,000 5,000,000		1910 1933		109 124	
E ii., n Elec. Illg. Oo. (Brooklyn) E lison Electric Light (Philadelphia)	5,000,000 2,000,000	5,000,000	1940		1221/	124
Kings Co. El. Lt. & Po. Co.pur. money 6s	2,500,000 5,176,000 8,000,000		1997	A. & O. A. & O. I. & A.	100 120 102} <sub>8</sub>	105 122
United Elec. Light & Power Co(N. Ÿ.)	5,000,000		····l	<u></u>		
Miscellaneous.	AND 1	G	KA	<u>- 77.</u>	<u> </u>	
Date of Quotation—July 2 1903 American Bell Telephone43.		1	908	F. & A.	1001/2	101 
NorthwesternTelegraph Co	•••••	i i	911	J. & D.	114	115 106
ALLIED						-
Miscellaneous.	1	1	- <u>-</u>			<u> </u>
Date of Quotation—July 2, 1100 American Electric Heating78.	\$00,000	\$00,000				1
Barney & Smith Car Co6s.			942	J. & J.	106	25 107
Carborundum Mfg Co	75,000		904	J & D.	115	127

#### NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16;@16;c.; Lake, 16;@16;c.; casting, 16@16;c.

Books of the Pittsburg Consolidate 1 Traction Co. closed June 30 for dividend purposes; they will be opened July 15.

The New York, Westchester and Connecticut Traction Company has filed a mortgage for \$2.540,000 for construction purposes.

A mortgage for \$7,000,000, covering all property of the Welsbach Light Company, has been recorded to secure the new issue of bon s.

Boston capitalists have secured franchises for five street railways in Terre Haute, Ind., and have incorporated a company with \$50,000 capital.

A dividend of 1 per cent will be paid on the stock of the Consolidated Traction Company of New Jersey on July 16. Books closed June 3) and reopen July 17,

The Telephone, Telegraph & Cable Company of America has called an assessment of \$2 50 a share, payable July 30. Books close July 25 and reopen August 2.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 11(2,13; New York Electric Vehicle Transportation, 6(3,6); New England Transportation, 3(3,3); Gramophone, 35(4,4).

Gao. W. Stern, of New York, claiming to own 500 shares of Pittsburg Consolidated Traction Company stock, has brought two suits in an effort to prevent the proposed lease to the United Traction Company authorized by special vote of stockholders.

The Central Electric Company of New Jersey has obtained control of the electric light companies of New Brunswicz, Porth Amboy, Rahway, Metuchen and Brund Brook, and will operate them under one management. The company is capitalized at \$100,000.

The Boston "News Bureau" says: We understand that the Massachusetts Electric Companies is making a very good showing of earnings and that it will shortly issue a statement which will show about a 14 per cent increase in gross earnings and but a 3 per cent, increase in expenses for a series of months.

The Chicago Union Traction Company has declared a dividend of 1½ per cent, on its preferred stock, payable July 2). Books closed June 3) and reopen July 25. An authority says that earnings for the first week of June decreased at the rate of from \$1,000 to \$1,500 per day. During last week the loss was about \$400 per day.

The directors of the Electric Vehicle Company met and took no action on the dividend. The company is not likely to pay dividends in the immediate luture. Two new directors have been elected, Colonel Albert A. Pope and Herbert Lioyd. Mr. L'oyt is the vice-president and general manager of the Electric S.orage Battery Company.

It is stated that Wilson and S evens of New York, representing the New York and Queens Gas and Electric Company, have purchased the Long I land City & Jamaica Company, controlling the Elison Electric Lluminating Company of Long Island City and the Jamaica Electric Light Company. The Elison Company is capitalized at \$500,000, with \$500,000 bonds, and the Jamaica Company at \$200,000, with \$100,000 bonds.

The matter of equipment of the elevated lines of the Boston Elevated Railway Company has been definitely settled. The contract for the multiple unit system will go to the Sprague Electric Company and the contract for the motors will go to the Westinghouse Electric Company. The contracts cover the equipment of 60 cars and involves the expenditure of about \$100,000 and \$200,000 respectively. The contracts for the car bodies, trucks and air brakes have not been placed as yet.

Directors of the United Power & Transportation Company of Philadelphia have declared a semi-annual dividend of 50 cents per share; in addition, 16 cents was declared on the second installment. This is at the same rate on the \$20 paid in as the 50 cents declared last December on the \$10 per share then paid in on the stock, the 16 cents representing the proportional dividend since the payment on the second call.

The General Electric Company and the Thomson-Houston Company have entered three suits against the Boston Elevated Railway Company in the United States Circuit Court, alleging infringement of patents in connection with motor controllers now generally in use on the defendant company's cars. While the Boston Elevated Company is made the defendant in the suits, the real parties concerned are the General Electric Company and the Sprague Electric Company, makers of the controllers.

Application for the appointment of a receiver for the Chicago Consolidated Traction Company has been made in the Circuit Court by Sutro Bros. & Company of New York, bankers and stockholders. Stockholders in the Consolidated Traction Company have objected to the control of the corporation by the Union Traction Company, which was practically brought about several months ago by the transfer of the stock of the Consolidated Company for morigage bonds of the Union Traction Company, and for this reason the appointment of a receiver is urged.

Judge Lacombe, in the United States Circuit Court, on June 29, appointed William Jay receiver of the Forty-second street, Manhattanville & St. Nicholas Avenue Railroad Company to succeed Hugh J Grant, who resigned. Mr. Jay's bond is fixed at \$100,000 In his petition, Mr. Grant calls attention to the fact that the interest of the stockholders demand that the Forty second Street road shall be operated in conjunction with the Third Avenue Railroad. This indicates that the receivership of the Forty-second Street road will be prolonged. It was thought that the receivership would terminate shortly after the termination of the receivership of the Third Avenue Railroad.

or the Third Avenue Railroad.

The Philadelphia "Stockholder" says: "Friends of Philadelphia Electric and Electric Company of America stocks assert that present prices will look remarkably cheap a few weeks hence. Both companies are reported to be doing a very heavy businesse. As regards Philadelphia Electric, it is stated that earnings are running at a rate which not only eliminates the necessity for a call on the stock, but warrants payment of a dividend before long. Coincidental with action of this character there would naturally be heavy buying of the stock and as a consequence higher prices would doubtless prevail. According to semi-official authority, the Long Island plant of the Electric Company of America has been sold and the purchase money turned over."

A consolidation of all the electric light and street million.

A consolidation of all the electric light and street railway companies in the city of York, Pa., under the title of the York County Traction Company, has been effected. The concerns included in this combination are the York Street Ediway Company, Edison Electric Light Company, York Steam Heating Company, York Light, Heat & Power Company, Westinghouse Leght, Heat & Power Company, York & Dallastown Electric Railway Company, York & Manchester Electric Railway Company and the York & Wrightsville Electric Railway Company. Edward C. Jones & Co, bankers, of New York & Ponladelphia, have purchased from the new corporation an issue of \$1,500,000 of fifty-year 5 per cent. gold bonds. Of the proceeds of this sale \$1,000,000 will be used for the acquisition of part of the above-mentioned properties and for extensions, the balance being retained for future improvements and betterments.

Vol. XVIII.

LIVIII, J.

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NEW YORK, JANUARY 10, 1900.

No. 1.

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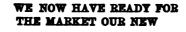
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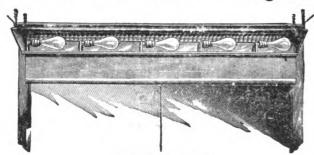
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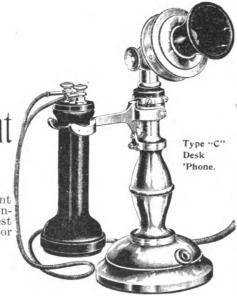
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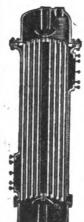


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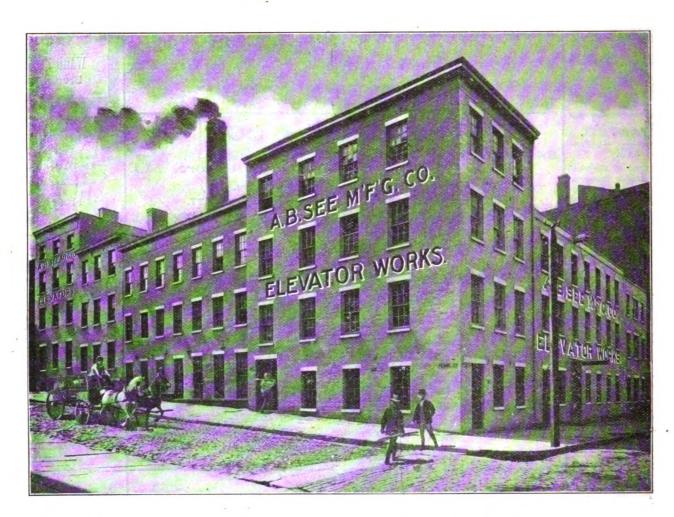
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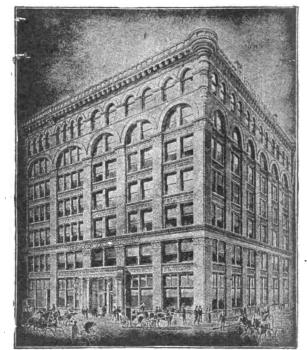
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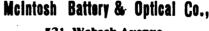


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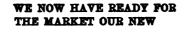
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the generating station and sub-station of a two-unit transmission plant.

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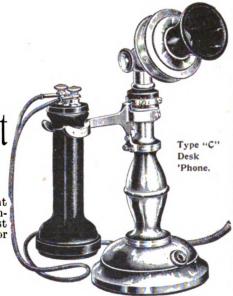
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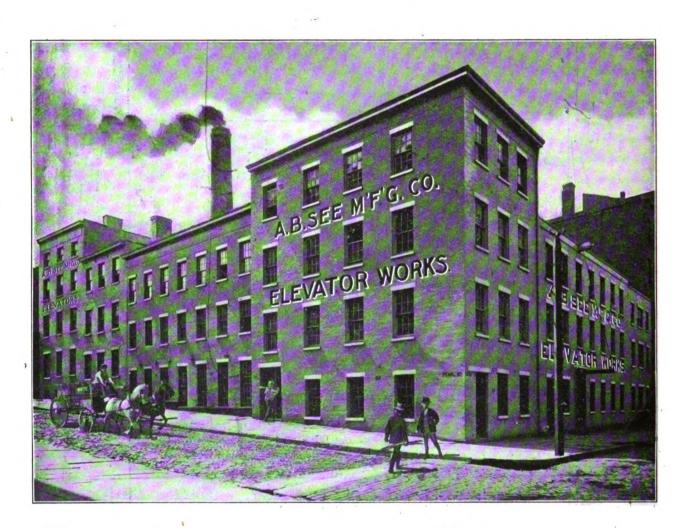
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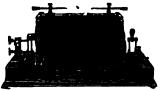
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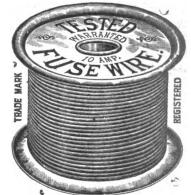
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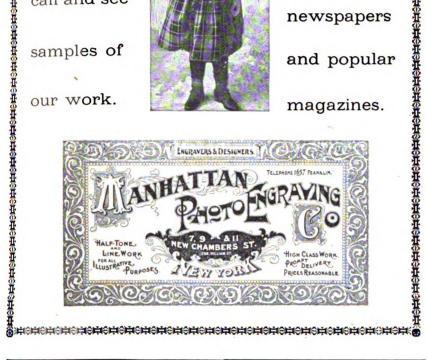


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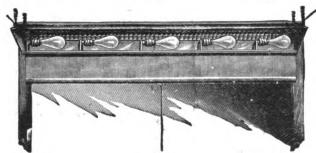
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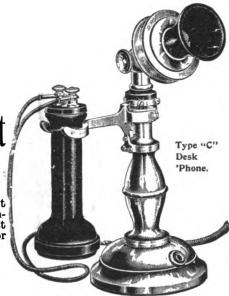
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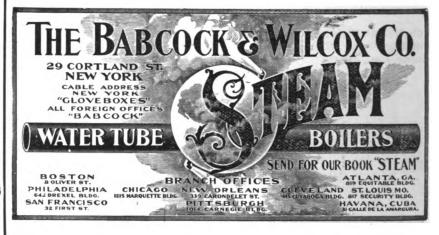


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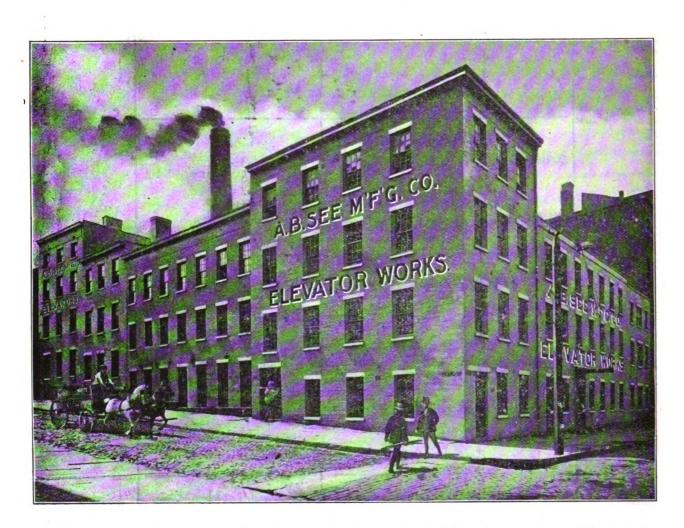
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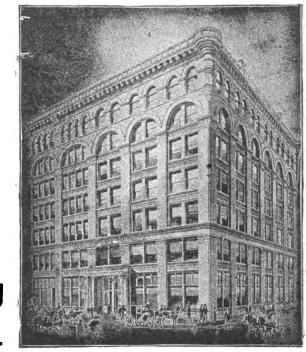
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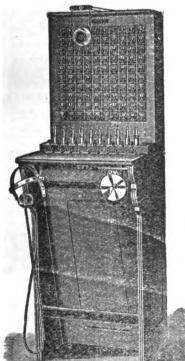
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Fig. 33. The connections of a three-phase generator with composite field windings.

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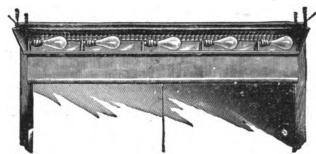
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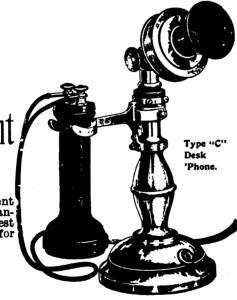
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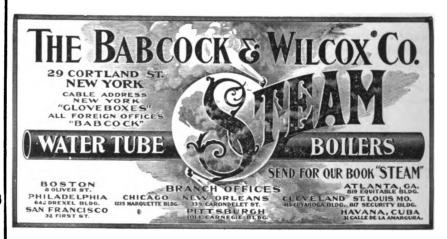


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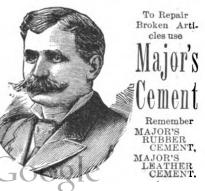
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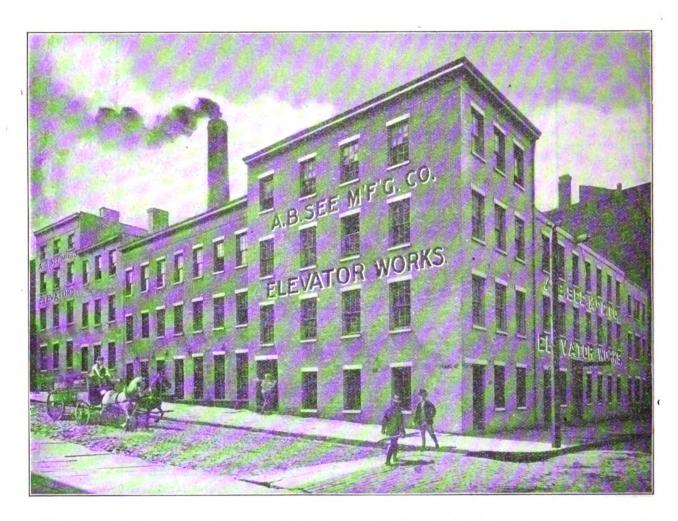
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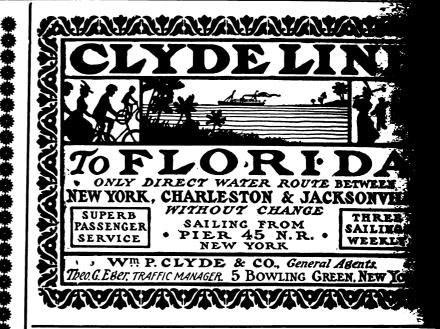


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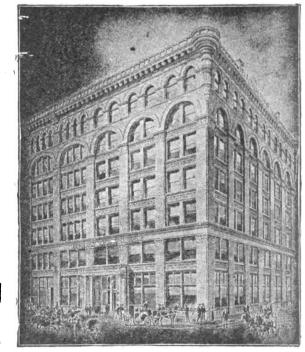
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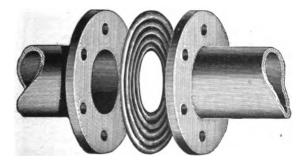
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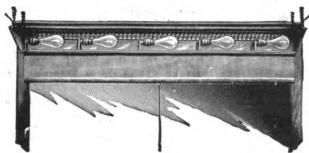
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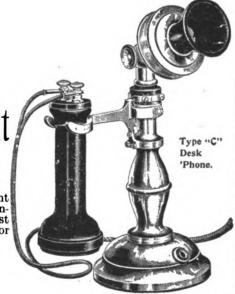
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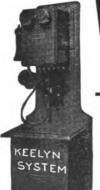
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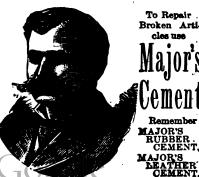
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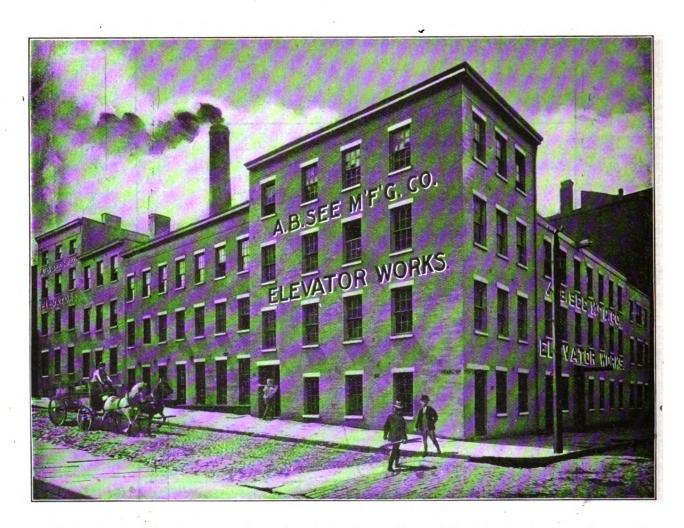
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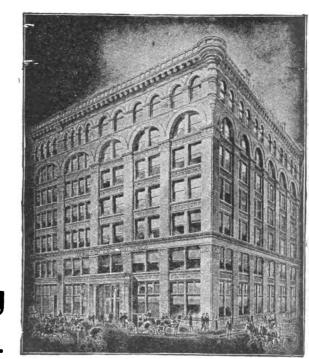
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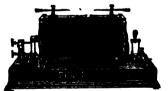
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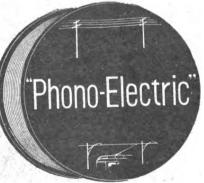
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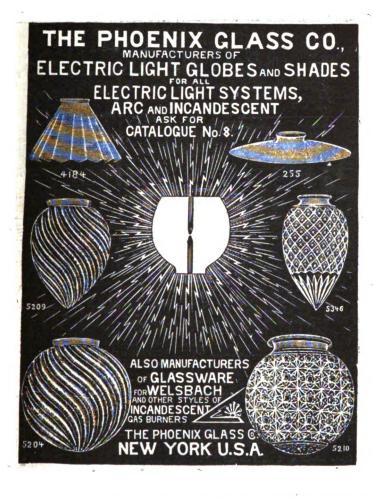
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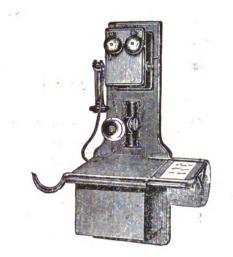
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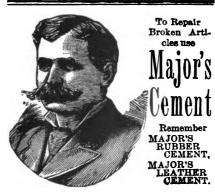
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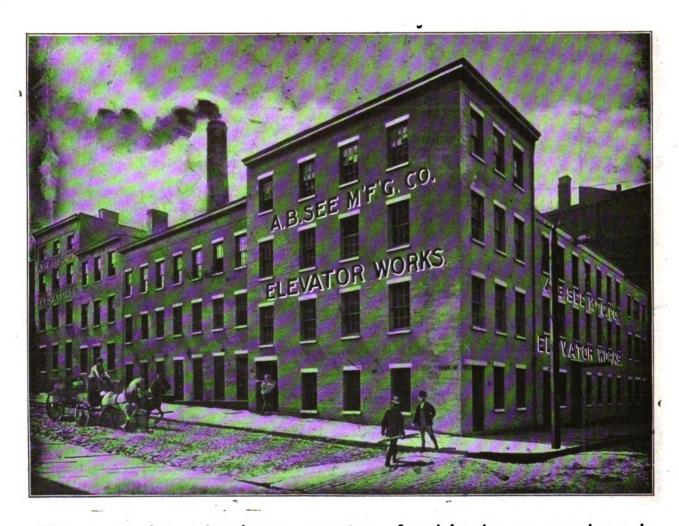
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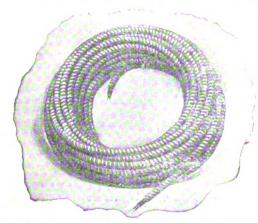
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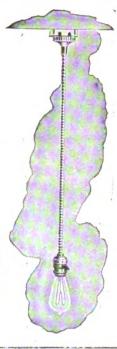
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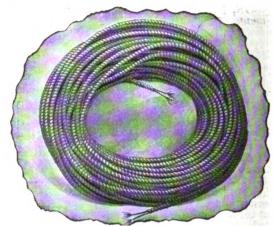
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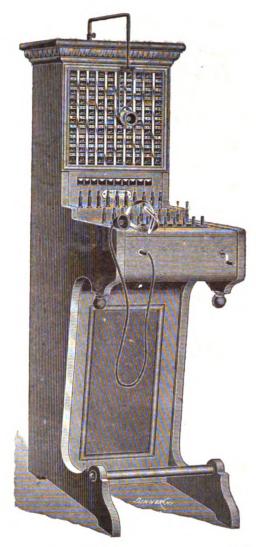
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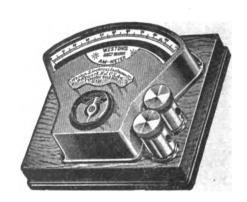
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